MAY

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

Floor of Maxillary Antrum—*Gerrie*
Local Anesthesia—*Reiter*
Orthodontics—*Miller*
Subarthrosis and Dysarthrosis—*Maves*
Postgraduate Instruction in Periodontia—*Merritt*
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Mottled Teeth—*Schour and Smith*
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Dental Caries
Administration of Anesthetics
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"A Tooth for a Child"

COUNCIL ON DENTAL THERAPEUTICS
Accepted Dental Remedies
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Trader Born—*Bell*
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FIFTY CENTS

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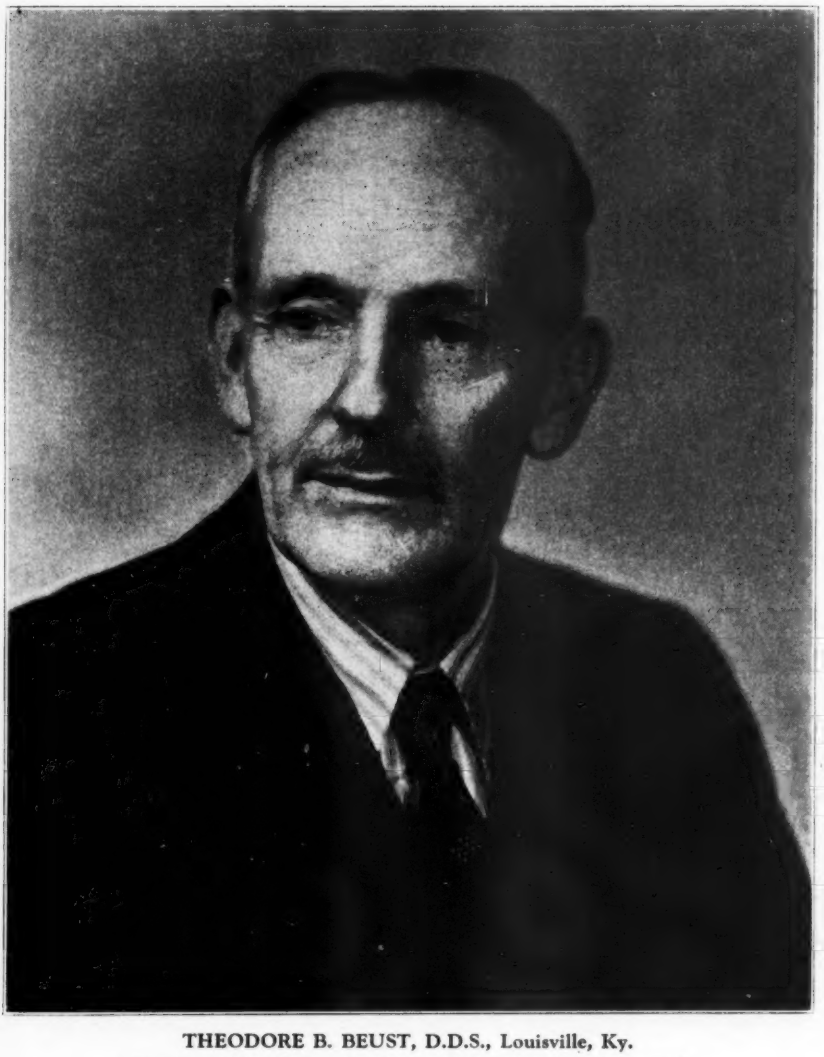

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THE JOURNAL
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Original Communications

THE FLOOR OF THE MAXILLARY ANTRUM*

By J. W. GERRIE, B.A., D.D.S., M.D., C.M., Montreal, Canada

AFTER some explanatory remarks on the antrum, its diseases and their treatment by the rhinologist, this article will deal in detail with the oral causes of sinusitis. Acute and chronic alveolar abscess, complicated extractions, fracture of root tips, curettage of sockets, fracture of the maxilla, the presence of foreign bodies, oral fistula and neoplasms will be considered and will be illustrated by cases showing the effects of these conditions and procedures on the antrum.

The cases are drawn largely from the otolaryngology service of Dr. George E. Hodge of the Montreal General Hospital over a two year period. Dr. W. L. Ritchie of the roentgenologic service supplied the majority of the roentgenograms here reproduced.

ANATOMIC PECULIARITIES OF THE ANTRUM

The antrum is present at birth as a tiny outgrowth from the middle meatus of the nose. It enlarges into the cancellous part of the maxillary bone, reaching its maximum size at about 25 years of age coincidently with the full development of the dental arch. It is pyramidal in shape and the cavity is bounded by five walls. (Fig. 1.) The orbital wall is seldom diseased, and, aside from carrying the infra-orbital nerve, has little surgical importance. The pterygomaxillary wall transmits the posterior-superior alveolar nerves and is likewise seldom the seat of disease. Because the anterolateral or facial wall is thin and accessible, it is the site of election for surgical exploration of the antrum, as in the so-called radical or Caldwell-Luc antrotomy. The nasal wall, in relation to the middle and inferior meatuses and conchae, is all-important surgically and pathologically, as it is by this route that approximately 80 per cent of sinus disease gains access. Here is situated the normal sinus opening through which the nasal mucous membrane is continuous with that of the antrum. The floor of the antrum or dental wall is made up of the hard palate and bony

*Read before the Edmonton Dental Society, Nov. 7, 1934.

*From the Ear, Nose and Throat Department of the Montreal General Hospital.

structures surrounding the bicuspid and molar teeth, and it is through this that the remaining 20 per cent of sinus disease makes its way.

The cavity is lined by a ciliated columnar epithelium which is part and parcel of the nasal, or, for that matter, the whole respiratory epithelium, and continuous with it at the nasal ostium. Antral disease is largely a disease of this mucous membrane brought on by a variety of pathologic influences.

A weak point in the make-up of the antrum is the fact that the normal nasal ostium is situated high, at the top of the nasal wall, which means that gravity drainage is poor.

Recapitulating: The antrum is a bony cavity bearing a relationship to teeth and nose, lined by respiratory epithelium and drained imperfectly into the nose by an ostium at its upper aspect.

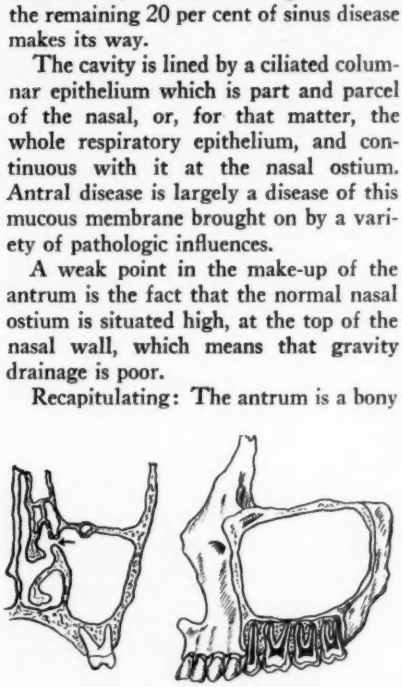

Fig. 1.—Diagrammatic frontal and sagittal sections showing relation of molar and bicuspid teeth in antral floor, nasal relations and maxillary ostium high in nasal wall as indicated by arrow.

ANTRAL DISEASES

The antrum is susceptible to the following common ailments: (1) acute catarrhal sinusitis; (2) chronic catarrhal sinusitis; (3) acute suppurative sinusitis or acute empyema; (4) chronic suppurative sinusitis or chronic empyema; (5) antral polyposis; (6) tumors and cysts: (*a*) of the antrum, (*b*) encroaching on the antrum; (7) traumatization: (*a*) by fracture, (*b*) by instrumentation; (8) oral fistula; (9) the presence of foreign bodies.

Brief descriptions of each of these with an orientation of the dental etiology will help clarify the subject.

1. Acute catarrhal sinusitis is part and parcel of every severe head cold and probably never has a dental source, the infection gaining entrance through the nasal ostium by continuity of mucosa. The mucous membrane is acutely inflamed, swollen and boggy, secreting first a thin, followed by a thick, glairy mucus. The condition proceeds to spontaneous recovery, but frequent repetition tends to produce a chronic change in the antral mucosa.

2. Chronic catarrhal sinusitis follows on repeated head colds and is favored by imperfect development of the nasal passages. The mucous membrane is thick and boggy and continually secreting a thick mucus, which collects on the floor of the sinus, occasionally escaping into the nose. The patient has a running nose and complains of continuous head cold. Causation is seldom dental.

3. Acute suppurative sinusitis or antral empyema is a disease in which the mucosa is infected by pus-forming organisms. There may be an associated necrosis or osteomyelitis of the maxillary bone. This condition is often spoken of in nose and throat circles as a "dental empyema" and the vast majority of the cases have a dental causation. Pus collects in the antrum. The patient complains of foul nasal discharge, nasal obstruction, headache and sometimes maxillary tenderness, and the sensation of elongation of the teeth on that side. Systemic symptoms of malaise, leukocytosis and low-grade fever may be evident. Occasionally, a progressive osteomyelitis of the bone develops, pro-

ducing orbital, facial or pterygomaxillary abscesses, which are mean, serious complications. I know of one such case in which the initial cause of the osteomyelitis was not dental but followed a Caldwell-Luc antrotomy. An abscess developed deep in the pterygomaxillary fossa, eroded the floor of the middle cranial fossa and produced a subdural abscess and fatal meningitis. Fortunately, such a condition is extremely rare, the antrum responding nicely when proper drainage is established.

4. Chronic suppurative sinusitis or chronic empyema may be chronic from the first or a later stage of the acute con-

Fig. 2.—Right, normal antrum filled with lipiodol, and left, antrum which has moderate hypertrophy of mucous membrane filled with same substance.

dition with less severe symptoms. The chronicity may be maintained by many conditions, such as the presence of a foreign body, fistula or polypoid growths or continuous infection by nasal routes. The patient has frequent or continuous head colds. Nasal discharge is present, and pus, foul or otherwise, may be washed out on antral lavage. Nasal and dental etiologies play about equal parts in causation of this type of sinusitis.

5. Antral polyposis or polypoid degeneration of the antral mucosa may be part of a general nasal polyposis or is the end-result of continued infection and irritation of the antral mucosa. It usually follows, and is a further stage of, the four above-mentioned conditions. Polypi are grapelike, mucus-containing growths of the mucosa which fill the antrum or line its sides, produce infected secretion and further inhibit drainage through the nasal ostium. This is frequently the end-result of a dental infection.

6. Tumors and cysts of the antrum itself are rare. They are largely malig-

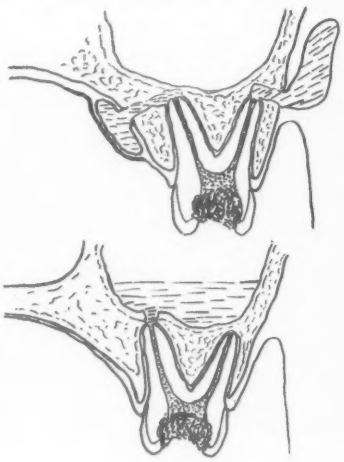

Fig. 3.—Above, diagrammatic representation of usual burrowing of acute abscess of mesial or distal upper molar root into cheek and occasional burrowing of lingual root abscess onto palate. Below, possible rupture of either of these into antrum.

nant tumors such as carcinoma or sarcoma and benign tumors, of which mucous cysts and osteomas are the common examples.

Neoplasms arising in surrounding structures are more common and usually of dental origin or from the bony alveolus. Most frequently encountered are radicular or root cysts coming from in-

fected tooth roots and dentigerous cysts in relation to third molar rudiments. Fibromas and malignant growths are also met with. When the antrum is encroached on, usually an irritative, low-grade sinusitis is set up, with hypertrophy and polypoid degeneration of the mucous membrane.

7. Traumatization by fracture of the superior maxilla, whether or not the upper alveolus is included, is bound to involve the antrum. The antral mucosa is torn, and bleeding into the sinus ensues. Any of the superior alveolar groups of dental nerves and vessels may be torn, anesthesia of the upper teeth resulting. The blood remaining in the antrum cannot escape and it therefore clots. There follows a slow absorption of this clot, which probably becomes infected, suppuration and nasal discharge resulting. It is inconceivable that a fracture involving the antrum and mucosa would not be followed by a residual sinusitis of a greater or less degree.

Traumatization by instrumentation means much the same thing, but will probably be less severe and less widespread in its effect unless a fistula is produced. A probe, drill or excavator passed into the antrum produces a minimum of trauma and will probably be without serious effect. On the other hand, any widespread or vigorous instrumentation here is disastrous and to be condemned, as will be brought out later.

8. Oral fistula in the canine fossa may be laid at the rhinologist's door because of injudicious placement or closure of a Caldwell-Luc incision or the removal of antral packing through this incision. The dentist or oral surgeon meets with it in the alveolus as a complication of the extraction of upper teeth, removal of tooth roots, too vigorous curettage of sockets or the removal of cysts. A permanent or even temporary fistula causes a mean and resistant type of suppurative sinusitis.

9. Foreign bodies are usually dental in origin, but may have been introduced by the rhinologist through the nasal wall or left in the antrum during a radical antral operation. The literature of the last twenty years records the following as having been found in the antrum: tooth roots, teeth, pins, shell fragments, root canal broaches, knife blades, tips of antral trocars, pieces of cotton wool, gauze swabs, rhinoliths, cement and socket dressings.

a. b.

Fig. 4.—Interlocking (left) and hypercementosis (right) of upper molar roots; showing impossibility of extraction without severe damage to antral floor.

RHINOLOGIC TREATMENT OF A CASE OF MAXILLARY SINUSITIS

The patient with sinus trouble will consult a nose specialist, complaining of nasal discharge, foul or otherwise, dropping of the same material backward into the throat, nasal obstruction, frequent head colds, a feeling of fullness and stuffiness in the head, perhaps headache, and sometimes tenderness of the cheek or upper teeth.

Examination of the nose will reveal engorgement of the mucous membranes, mucus or pus on the floor of the nose and the same material running down over the inferior turbinate after its escape through the maxillary ostium. The rhinologist may transilluminate the case and reveal opacity of the involved sinus. Roentgenograms (Figs. 5-10) are preferable to transillumination as they show detail and have less tendency to error. Having proved opacity of the involved sinus to direct light or roentgen rays, the next step is to find out what is in the antrum. This is done by a procedure known as diagnostic puncture or antral lavage. The inferior meatus is cocainized and an antrum trocar passed through the nasal wall into the sinus. The patient's head is lowered and a quantity of saline or boracic acid solution is washed through the antrum via the trocar, returning by the maxillary ostium. In this way, the contents of the antrum are washed out, caught in a basin and examined. The usual findings in an infected antrum are a thick mucus or frank pus. A dental empyema produces a copious, foul, characteristic pus. A further refinement in diagnostic technic is the injection of an iodized oil such as lipiodol into the sinus and the taking of a further series of roentgenograms (Figs. 2-12) with the oil in place. The oil cannot fill in spaces occupied by polyps, cysts, hypertrophic mucous membrane or foreign bodies, and these show up as filling defects or radiolucent areas. The surgeon then has a concrete idea of the contents of that antrum and will proceed accordingly with treatment.

If it is indicated, he will first see that attention is given to possible contributive factors such as deflection of a septum or hypertrophy of a turbinate, or abscessed teeth and oral fistulas.

In numerous cases, the establishment within an infected antrum of adequate drainage will cure or alleviate the disease. This is done either by repeated antral lavage (the same procedure as diagnostic antral puncture described above) or, in more persistent cases, by an operation known as the simple or intra-

Fig. 5 (Case 1).—Acute suppurative sinusitis and quantity of waxy socket dressing in antrum. Lipiodol had been injected into the right antrum and a marked filling defect is evident, probably due to hypertrophied mucous membrane and the socket dressing.

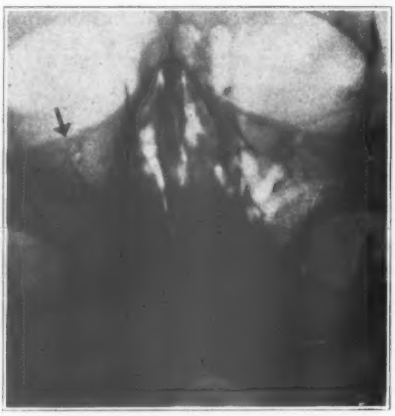

Fig. 6 (Case 2).—Right antrum containing tiny molar root tip, which could not be discerned. There is evidence of sinusitis.

nasal antrotomy, which consists of removing a large area of thin bone and mucous membrane along the lateral wall of the nose beneath the inferior turbinate, the object being to establish a large, permanent drainage communication between nose and antrum.

If there is marked hypertrophy of the mucous membrane, mucous polyps, foreign bodies or tumors, the so-called radical or Caldwell-Luc antrotomy will be necessary. The principles of this operation follow: A horizontal incision is made in the mouth across the canine fossa well up toward the labial reflection and extending from the second molar tooth forward to the cuspid or incisor. The mucoperiosteum is elevated well up toward the infra-orbital nerve and the antrum opened into, an opening usually bigger than a large nickel being made. Here, unfortunately, the nerve supply to the bicuspid teeth must be sacrificed. Through this opening, the contents and every angle of the antrum can be viewed and treated accordingly. The diseased mucous membrane is stripped free and brought away. After the antrum is treated, it is necessary to provide for drainage of the antrum into the nose, and, for this purpose, a large opening, identical with that described above for the simple or intranasal antrotomy, is made. A wick of drainage gauze is placed in this opening for twenty-four hours or less and brought out through the nose. The oral wound is sutured tight. Thus, the antrum has been treated, its diseased lining removed and provision made for permanent drainage into the nose. Theoretically, a normal mucous membrane regenerates within three months.

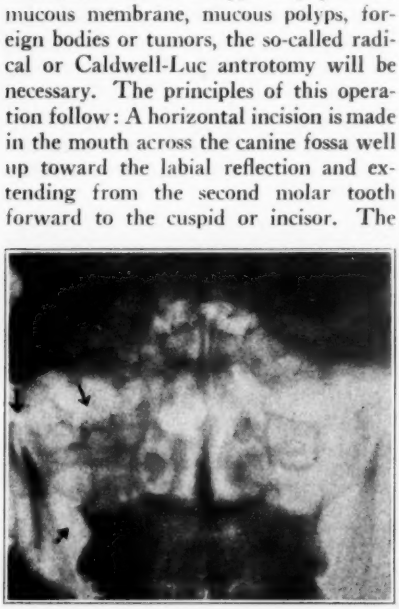

Fig. 7 (Case 4).—Fracture into antrum from blow on cheek, with fracture of maxillary root of zygoma, infra-orbital ridge and down through infra-orbital foramen into mouth.

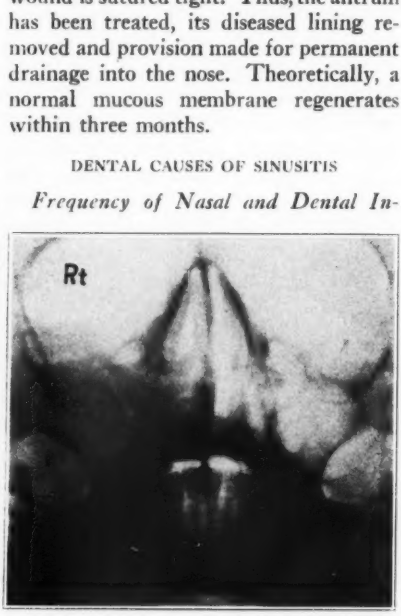

Fig. 8 (Case 5).—Gauze swab present in antrum forty-five days after operation.

DENTAL CAUSES OF SINUSITIS

Frequency of Nasal and Dental Involvement.—The part played by dental conditions in the production of antral disease is a favorite bone of contention among nose and throat specialists. Some go so far as to claim 100 per cent of sinus disease has a dental etiology and others take the opposite extreme, attributing only 2 or 3 per cent to dental conditions. I estimate that about 20 per cent originate from structures in the upper alveolar process. This figure would

vary with climatic conditions and the prevalence in those climates of hypertrophic rhinitis and allergic conditions of the nasal mucous membranes. As the prevalence of these conditions is greater, so the percentage of sinus disease due to nasal conditions is also greater. A recent article by Stevenson[1] gives one of the only frank discussions of the dental causation of antral disease that I have seen. He reports approximately 200 cases of sinus disease which came to operation, and of these he says: "Thirty-two cases, or about 16 per cent, followed the extraction of teeth. Hempstead found 63 cases among 385 patients—a percentage of 22.5. Skillern was inclined to accept

Fig. 9 (Case 6).—Common straight pin in left antrum.

20 per cent as the proper proportion."

Mouth Structures Involved.—The first molar tooth is the great offender. Next in order of frequency come the second molar and second bicuspid, with the third molar, first bicuspid and cuspid, and more rarely the incisors, playing occasional parts. The alveolar bone contributes a small quota. In Stevenson's series, the teeth involved were as follows: first molar, eight cases; second molar, four; third molar, four; first bicuspid, one; second bicuspid, four; cuspid, one; second bicuspid and first molar, eight; all teeth on affected side, eight.

Alveolar abscess *per* se is rarely a demonstrable cause of sinusitis. True, tooth roots closely approach the antrum, yet invariably they are covered by a shell of hard eburnated bone through which the abscess finds it hard to pass. Acute abscesses of the upper teeth (Fig. 3), if they are going to burrow and extend, pass through the buccal plate of bone and up into the tissues of the cheek outside the antrum. Occasionally, an abscess of a bicuspid or the lingual root of a molar will appear in the palate, and I suppose an acute abscess occasionally breaks through that hard eburnated layer of bone into the antrum, producing a maxillary sinusitis of an acute nature. The latter condition, as yet, I have never seen. Stevenson says[1]:

> Personal observation gives the impression that few cases of maxillary infection are due to diseased conditions about the apexes of teeth before extraction was done. I can recall only two cases that were diagnosed before the extraction of a tooth. What has been more frequently encountered has been antral disease secondary to the extraction of a tooth. I am not prepared to state that dental manipulations have been responsible for secondary infection, nor in every case that secondary infection was avoidable. However, it is a fact that in most of my cases nasal symptoms did immediately follow and did not precede dental surgery.

With the chronic type of abscess or granuloma, the relationship is not so clear. One cannot say definitely whether the granuloma was the starting point of the antral disease. The sinus condition over such roots is usually of the chronic,

1. Stevenson, W.: Chronic Maxillary Sinusitis, Arch. Otolaryng., 13:506 (April) 1931.

polypoidal type, and the dental condition may or may not have been the initial cause. There are many normal antral floors which have granulomatous roots closely associated with them. Thus, the culpability of the chronic granuloma in the production of antral disease remains, for the present, an indeterminate factor.

Extraction of Upper Posterior Teeth.—The commonest complication in the extraction of upper first and second molars is fracture of the buccal plate of bone. Fortunately, the line of fracture is not high enough to involve the antrum and uneventful healing follows. Not uncommonly, anomalous conditions of roots, such as hypercementosis, clumping or locking of areas of bone between the tips (Fig. 4), make removal impossible without more or less damage to the antral floor. In less severe cases, careful operating may avoid sinus complications. Frequently, in the extraction of a long-devitalized or granulomatous upper first or second molar with clump roots or hypercementosis, the piece of bone contained between the roots comes away, bringing with it the adjacent part of the antral floor. Probing proves communication with the antrum. The operator

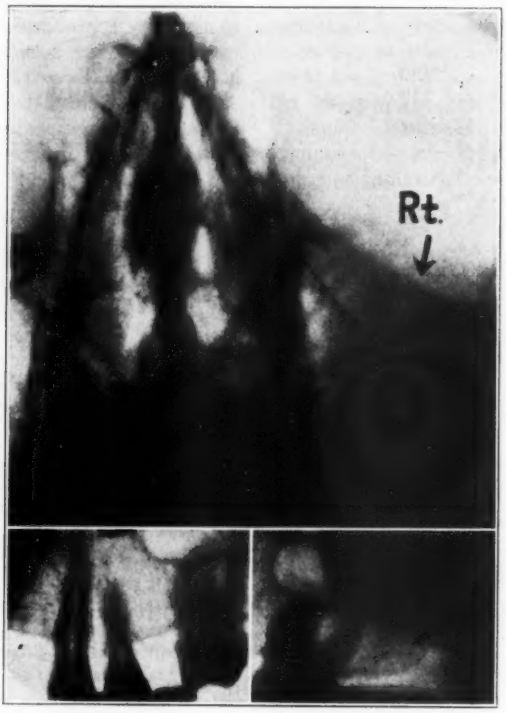

Fig. 10 (Case 7).—Mucous cyst on antral floor. Above, cloudy antrum. Below, apparent relation of cystic structure to first molar.

might well be content with this initial diagnostic probing and leave bad-enough alone or else pack the superficial part of the socket lightly with iodoform gauze, the object being to prevent access of foreign material from the mouth and coax the blood clot deep in the socket to organize and close off this oral-antral opening. Under no condition should a wax or pasty socket dressing or a piece of free medicated cotton be used. The following case is illustrative of such an extraction

Fig. 11.—Patient with long-standing fibroma of maxilla which had impacted third and supernumerary fourth molars in close relation with antral floor.

with subsequent packing of the socket with a waxy socket dressing:

REPORT OF CASES

CASE 1.—A. O. Freedman, of the ear, nose and throat staff of the Montreal General Hospital made available the roentgenograms which are shown in Figure 5. A long-devitalized and much-filled upper right first molar was extracted with considerable difficulty and surgical removal of bone. The cavity was packed (as was later ascertained) with a wax or paste socket dressing. A very acute sinusitis followed, with obstruction of the right side of the nose and a foul prenasal and postnasal discharge. The socket was repacked daily for several days. Roentgenograms were taken which revealed the obvious sinusitis (Fig. 5), but were of no further help from a diagnostic standpoint. I first saw the patient about ten days after the extraction, when he was feeling very miserable and bothered by the foul nature of the discharge. The mouth wound was healed over. When the sinus was lavaged, there was a very foul, frothy, pus-laden return. This procedure was repeated several times without improvement. Finally, under local anesthesia, an operation of the intranasal or simple antrotomy type was performed and the antrum lavaged through this opening. Besides the foul pus, large amounts of a thick brown waxy material, the socket dressing, came away in the washings. Marked improvement followed after several lavages.

Curettage of Sockets.—The word "curettage," which implies a vigorous scraping motion, is correct when applied to the removal of necrotic or infected bone. This procedure and this term have no place at all in the removal of granulomatous areas from root sockets, and I much prefer the term "enucleation" suggested by Dr. Saunders at one of Dr. Walsh's Montreal clinics. If a granuloma is to be removed, it should be gently teased away or enucleated with no disturbance of its bony walls. This holds especially true in relation to the antral floor, where granulomatous areas were better left alone or cautiously enucleated. Quoting Stevenson again:

In seventeen cases, there was a persistent fistula leading into the sinus at the site of the extracted tooth. I am not able to state definitely that these fistulas would have occurred from simple extraction, but I have

been impressed with the number of patients who, after the extraction of teeth, have had the socket of the tooth curetted widely by dentists who have made no attempt to close the wound.

Removal of Root Tips.—In the removal of upper first and second molars, it is far better to proceed at once, laying down a gum flap and chiseling away the buccal plate of bone, exposing the tip rather than attempting strenuous elevation or the removal of an area of bone beside the root with a drill. Visibility is poor and often the drill slips through

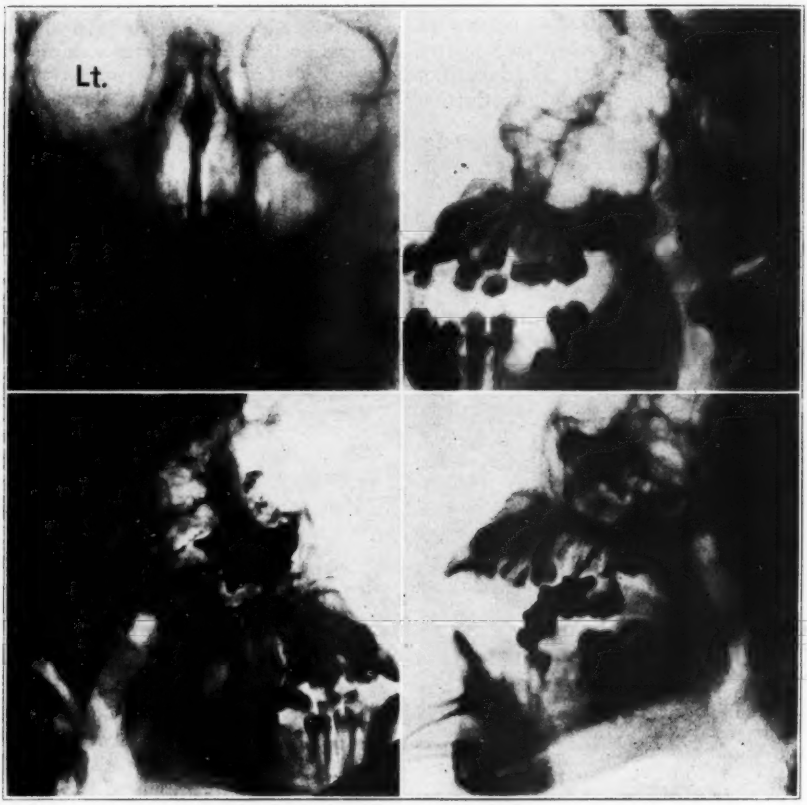

Fig. 12 (Case 8.)—Left to right: Anteroposterior and lateral plates showing cloudy antrum and impacted teeth in relation to antral floor; involved antrum filled with lipiodol, and three hypodermic needles thrust into growth.

fracture of a root tip is a most distressing complication. In such a case, if gentle manipulation with a straight tine or picklike elevator fails to dislodge the tip, into the antrum; which provides the necessary opening for the root to follow.

Occasionally, a root tip is seen which can be dislodged upward in the direc-

tion of the antrum, or is loose, but on which no leverage can be obtained to effect its removal. This probably means a small communication with the antrum and the root yet in its relative position in the socket. In such a case, it is worth while to get the patient to blow the nose vigorously once or twice as the positive pressure so created in the antrum may force the root down.

If the root tip has already passed from sight, it may have slipped just under the mucosa and still be adjacent to the socket, or it may have passed through the mucosa into the antrum and be inaccessible. In

Fig. 13.—Specimen removed in Case 8. Below is the impacted cuspid and above the fibroma surmounted by the impacted third molar, beyond which the protruding root tip of the supernumerary fourth molar can be seen.

the former case, its removal may still be possible by taking away the buccal plate of bone, exposing the opening and teasing the tip out under direct vision. The flap will fall over this small antral opening buccally and prevent a fistula forming; which is not the case if the initial opening is enlarged through the socket.

On failing to obtain the root tip by this means, it is good surgical procedure and sound advice to tell the patient that there is a root tip in relation to the antrum that you are rather diffident about trying to get out, also, that sinus trouble may ensue. The patient, at this stage of the operation, will be only too glad to call quits and defer consultation with a rhinologist until sinus trouble does ensue. Then everything is out in the open, all parties are properly informed and there is no negligence. When sinus trouble does become evident, there should be consultation between the dentist and rhinologist, so that the former may give the latter the details of the extraction. Forcing a root into the antrum is nothing to be hidden and is neither a crime nor evidence of slipshod methods. Of course, one might keep silent, hoping that the patient would not connect the ensuing sinus trouble with the extraction, yet it would be rather disconcerting and possible meat for legal action if the root were discovered in the antrum when a radical antrotomy was finally performed and the patient had not been informed of the presence of the root.

Worthy of vigorous condemnation is the heroic removal of large parts of alveolar bone via the socket in an effort to locate a lost root. It is due to this procedure that large oral fistulas develop, providing one of the meanest complications of sinus disease. Here are Stevenson's words:

> The day of maxillary drainage through the alveolar process has long since passed. Dentists should recognize the fact that serious, chronic complications will almost invariably ensue if curettage is so done that a large hole is broken through the process into the maxillary sinus. The difficulty of eradicating such a fistula is very great. Small fistulas respond readily to treatment. Large ones present a complicated problem, even though drainage is established in the nose counter to the fistula (by the simple intranasal operation). In one of my cases,

an opening still remains through which one's little finger may be passed, although I have made five or six attempts to close the opening. The fistulas in all of the other cases were closed in either one or two attempts.

The following is a typical case of a tiny root tip in the antrum, except that the rhinologist was not aware of the extraction details and the patient did not know a tooth root was not accounted for:

CASE 2.—Mrs. M. G., aged 27, came to the outpatient clinic complaining of pain in the face and discharge from the nose of a thick yellow pus which dropped back into the throat. These symptoms had been present for the past four months, since the extraction of an upper right first molar tooth. She believed the extraction was difficult, but knew of no roots having been fractured. Sinus roentgenograms (Fig. 6) showed a cloudy right antrum, but no foreign body could be seen at the time or in retrospect. A thick mucus was present in the right half of the nose. There was tenderness over the right antrum. The extraction wound was healed over. The sinus was lavaged at weekly intervals, a thick mucopus coming away in the washings and with only temporary improvement. Had the presence of a root been suspected, a Caldwell-Luc antrotomy would have been performed without further delay. As it was, the patient was treated for six months in the hope of improvement by conservative measures before the sinus was finally opened. A right radical antrotomy was performed, the antrum containing thick mucopus and a polypoidal mucous membrane. The presence of a root was not suspected, and in the blood of the operation, it was passed over. It did not come away with the removal of the diseased mucous membrane. The patient was discharged on the eighth day after operation for outpatient follow-up and returned on her first visit carrying an upper molar root tip about 2 mm. in length, which came away in her handkerchief on blowing her nose. This had evidently remained in the antrum throughout the operation and convalescence and trickled out into the nose through the large intranasal opening which was made at operation. The sinus disease then cleared rapidly.

A Whole Tooth in the Antrum.—Such a condition is rare. The offending tooth is usually the third molar, finding its way into the antrum at the time of jaw fracture or in the removal of impacted teeth. Hervey[2] reports a case which occurred with fracture. A fistula and suppurative sinusitis were present.

Socket Dressings.—Socket dressings of any kind may be used freely provided there is no antral communication. If the antrum has been opened, no free wax, paste or cotton soaked socket medicaments should be used, as they may easily find their way into the antrum. The socket may be packed lightly at its superficial aperture with a medicated gauze, the ends of which are secured with a suture. Better procedure still is the removal of the alveolar tips with a rongeur to permit approximation and suture of the gingival margins.

Fracture into the Antrum.—Fracture into the antrum in the course of extraction of upper first and second molar roots is not rare, the line of fracture taking off the tuberosity of the maxilla and involving the lower posterior corner of the antrum. The amount of subsequent sinus involvement varies with the severity of the trauma and operative procedures. If no fistula or foreign body is present, the worst that can happen is a latent low-grade chronic sinusitis due to irritation and damage of the mucous membrane from the fracture. A case in point is the following:

CASE 3.—L. R., a man, aged 24, was having a broken-down second molar extracted. While elevating on the mesiobuccal root

2. Hervey, Wallwyn: D. Cosmos, 69:107 (Jan.) 1927.

with the first molar as a fulcrum, I was surprised to see very definite movement of the third molar. Further investigation showed movement extending across the hard palate to the median line, indicating a fracture of the whole alveolar process and tuberosity distad from the first molar. Fortunately, the fracture line loosened the roots in question, which came away easily. The fracture had thrown the third molar definitely out of occlusion, and as I could not replace it, I removed it also. The patient was seen for the two days following. No untoward symptoms developed. I have not seen him since, but feel quite sure that the mucous membrane in that corner of the antrum will have become hypertrophied and polypoidal and that at some time he will apply to a rhinologist for treatment of a sinus condition.

As for fracture into the antrum, aside from operative trauma, much the same holds true, with a few added features. Most upper jaw fractures involve the antrum, as do also some nasal fractures and fractures of the maxillary root of the zygoma. If the trauma has been great and there has been tearing of the antral mucosa with bleeding into the antrum, a sinusitis is liable to ensue. Blows on the cheek bone are very apt to produce fracture through the infra-orbital ridge and infra-orbital foramen and down into the upper jaw. The following case is illustrative:

Case 4.—J. G., a man, aged 28, was struck while umpiring a ball game when one of the players tossed a bat toward the dugout, the heavy end striking full on the maxillary root of the zygoma. The occlusion of the teeth from cuspid backward was immediately affected. After an interval of about three minutes, the nose bled slightly. Inside five minutes, the eye was swelled shut. There was anesthesia of the upper teeth on that side and also over the whole distribution of the infra-orbital nerve. On blowing of the nose once, the eye swelled to a greater extent, a surgical emphysema becoming evident in the soft orbital tissues. Swelling prevented palpation of the injured bones, but from the findings given, it was evident that there had been a fracture of the root of the zygoma and also into the orbit and down through the infra-orbital foramen, deranging the nerve, and extending into the mouth. The three-minute interval between the appearance of nasal bleeding indicated that the antral mucosa was torn, the time being occupied in filling the antrum with blood before it could spill over into the nose. The surgical emphysema on blowing the nose meant a communication between antrum and orbit. The anesthesia of the upper teeth pointed to derangement of the posterior and middle groups of superior alveolar nerves which course down the posterior and facial walls of the antrum. Anesthesia of the cheek and side of the nose meant compression or injury of the infra-orbital nerve. Roentgenograms (Fig. 7) confirmed the suspected fracture. With such an injury of the mucosa and filling of the antrum with blood clot which must absorb, it was inconceivable that a chronic sinusitis of some degree should not follow. At the time of writing, two months after injury, the most bothersome feature is the presence in the nose of an abnormal amount of thick mucus. The occlusion of the teeth on mastication returned quickly to normal and the infra-orbital anesthesia began to disappear at six weeks. The cuspid on that side, which was in the line of fracture, is a little tender. Apparently, a chronic sinusitis is developing.

Foreign Bodies.—When antrums have foreign bodies of a soft or organic nature forced into them, they invariably develop an acute suppurative type of sinusitis. Bits of cotton or socket dressings may gain access through a socket, or gauze swabs or cotton be left in the antrum during operative procedures. Stevenson admits having left swabs in antrums in two cases, both of which continued to suppurate, with acute symptoms until the antrums were examined and the foreign bodies removed. The case above reported

of a socket dressing in the antrum is typical and I also know firsthand of two cases in which pieces of gauze were left in the antrum at the conclusion of Caldwell-Luc antrotomies. I report the following:

CASE 5.—A. L., a woman, aged 25, had a left-sided Caldwell-Luc operation for a chronic sinusitis. Recovery was slow, the patient running a low-grade temperature and the left cheek remaining swollen and tender, with copious discharge from the nose. Repeated antral irrigations through the nasal opening yielded small amounts of pus. The swelling finally subsided and the patient was discharged twenty-two days after the operation for outpatient follow-up. The nose continued to discharge bothersome amounts of pus in spite of daily nasal douches and Nichol's suction. Aside from this, nothing untoward was noted until thirty-five days after operation, when the cheek began to swell and was tender and trismus set in, the patient being unable to open the jaw more than a quarter inch. The left nose was blocked and the inferior turbinate swollen and pus exuded beneath it. The patient was readmitted to the ward with a temperature of 99.4; pulse, 138; respiration rate 22, with an obvious cellulitis of the cheek. Irrigations of the antrum produced foul-smelling, serosanguinous discharge. Roentgenograms (Fig. 8) showed only a cloudy left antrum, although more so than the one taken prior to the original operation. Symptoms continued unabated. On the fifty-eighth day after the first operation, the antrum was reopened and a piece of packing gauze removed. Progressive recovery followed.

Metallic foreign bodies such as root canal reamers, broaches, pins or tips of antral trocars produce a much less severe reaction on the part of the offended antrum, a chronic irritational sinusitis being the result. Here is, from a dental standpoint, an interesting case in which a common straight pin remained in a maxillary antrum, unknown to the patient, for eight years: .

CASE 6.[3]—F. M., a man, aged 30, complained of symptoms of chronic sinusitis of several years' standing, and which had been worse during the past three months. He had been consulting a rhinologist in an outlying district and had had nineteen antral lavages without relief and apparently no roentgenogram had been taken. He consulted R. Percy Wright, of the nose and throat staff of the Montreal General Hospital, and roentgenograms then taken (Fig. 9) revealed a cloudy left antrum with what appeared to be a common straight pin with its head in the anterosuperior angle and the point passing downward and backward toward the alveolar area. The patient denied any knowledge of a pin's having been used at any time in the nose or mouth. The first bicuspid and three molars on that side were missing and the remaining teeth vital. The first and second molars had been removed from eight to ten years previously and the third molar two years previously. The patient could recall nothing of import about the extractions and could not even remember who had performed them. A radical antrotomy of the Denker type was performed and the pin found in the indicated position, enmeshed in tough, polypoidal antral contents.

It is interesting to surmise how the pin came to be here. The logical conclusion is that, during the extraction of the first molar, part of the antral floor came away. In the absence of a probe, the operator probably called the pin into play as such and it slipped from the grasp of the fingers or forceps and was lost in the antrum. All this could well have happened without the patient's knowledge.

Oral Fistula.—Oral fistula is a complication of nose and mouth conditions to be avoided by the rhinologist by making the Caldwell-Luc incision well up toward the gingivolabial reflection, closing it carefully and removing the antral

3. Wright, R. P., and Gerrie, J. W.: Canad. M. A. J., 28:65-66 (Jan.) 1933.

packing through the nose, and by the dentist or oral surgeon, who should refrain from the removal of too much alveolar bone, by judicious operating and treatment of sockets in which antral communication has been established. The nasal mucous membrane is respiratory and has its peculiar functions and secretions. The oral mucous membrane, with its specific functions, secretions and well-known infections, is alimentary. Oral secretions and débris seeping through a fistula into the antrum are tremendously irritant and the cause of much suppuration. Many a case of empyema of the antrum dates the onset of recovery from closure of the oral fistula, and one of the secrets of a successful Caldwell-Luc antrotomy is the early and complete closure of the oral wound.

If fistula is imminent through an alveolar wound, either the gum flaps should be sutured into apposition or the socket dressed judiciously as above indicated and the patient warned against blowing the nose or attempting to suck air through the wound. I think lavage of the antrum through this wound is contraindicated unless the opening is large and shows no inclination to close by natural means.

The closure of a fistula is an oral surgical problem and will be done in the case of small ones by undermining, scarifying the edges and suturing, or by an elliptical incision, or, in the case of larger ones, by making a variety of flaps.

Tumors and Cysts.—This treatise is interested in those tumors and cysts starting in the mouth or upper alveolar process and invading the antrum, considering (1) malignant neoplasms. Occasionally, a sarcoma or carcinoma of the roof of the mouth involves the antrum. Here, early diagnosis is of the utmost importance and the sinus condition pales into insignificance, although sinus diagnostic methods are helpful in determining the extent and operability of the growth. Tissue should be cut from the growth and submitted to microscopic examination if there is the least suspicion of malignancy. Then the condition becomes a major surgical problem. I recall a case which was on the surgical ward of the hospital and of which I have not the details. I saw the patient on admission, when there was a hard bony swelling and fullness of the hard palate linguad from the last two molars. No other signs or symptoms were noted. Diagnosis was in doubt for some time, but finally growth appeared on the buccal side of the teeth. A biopsy was made and sarcoma of the maxilla reported. A total resection of the maxilla was performed with fatal termination. On postmortem, the growth was found to almost completely fill the antrum, which contained pus and débris. A preoperative nose and throat investigation with lipiodol roentgenograms would have been interesting and helpful in showing the extent of the growth. Tumors of lesser malignancy, such as the first three grades of carcinoma (Broder's classification), have a more hopeful outlook and respond rather well to treatment by combinations of radium therapy and surgical measures.

To proceed with (2) benign neoplasms: Most commonly, radicular and dentigerous cysts encroach on the antrum. Multilocular cysts seldom make their appearance here and are more common in the lower jaw. Diagnosis again becomes important and good dental roentgenograms are invaluable. The earlier these growths are diagnosed and removed, the better. By the time there is bulging and egg-shell crackling of the labial and palatal plates of bone, the antral floor too will be pushed up and thin.

It seems peculiar of cystic growths that a thin shell of bone follows out over the tumor and remains intact for some time. This is particularly true of the antral floor, and that hard, eburnated layer of bone fortunately gives away reluctantly. As the antrum is encroached on, a hypertrophy and polyposis of the antral mucosa with suppuration is prone to set in and there may be nasal symptoms. Flat sinus roentgenograms and lipiodol plates will be helpful in determining the extent of involvement of the antral floor. If the cyst breaks through the floor, it may or may not rupture and give a nasal discharge, recurring periodically as it ruptures and fills again. Cysts here, of any size, especially if the antral floor is gone, prove a difficult surgical problem. The following case is interesting from the standpoint of cystic structures:

CASE 7.—J. H., aged 32, had had a previous bilateral radical antrotomy. The left side was clear, but the right side would periodically discharge large amounts of mucus. Investigation showed that the nasal opening from the previous operation was still widely patent and providing excellent drainage. Sinus roentgenograms (Fig. 10, above) showed a cloudy right antrum. Dental roentgenograms (Fig. 10, below) showed an apparent cystic structure in relation to the first molar roots. The second bicuspid and other molars were missing on that side. The molar tooth was vital, which militated against the presence of a radicular cyst. Secondary radical antrotomy was carried out and a cystic structure containing a milky mucus was found in the region of the first molar. The bone of the antral floor was intact and the cyst was apparently of nasal origin and entirely independent of the molar tooth.

Other benign tumors, such as fibroma and osteoma, are occasionally found in this region. The following interesting case of a fibroma of the maxilla causing deep impaction of a third and supernumerary fourth molar is abstracted from the original report[4]:

CASE 8.—S. S., a girl, aged 13, was seen by me in consultation with Dr. Walsh in the oral surgical clinic and transferred to our service under Dr. Hodge for further investigation. She complained of facial asymmetry (Fig. 11), absence of molar teeth on that side and the presence of a soft area in the gums. The history is interesting and significant, as for nine years the child had been buffeted about from clinic to clinic without a complete understanding and investigation of the condition. The swelling of the face, which was soft and painless, was first noted at 4 years of age and, during the past six years, no appreciable change had been manifest. At six years of age, in the children's clinic, a hard swelling of the gum was noted about the left upper molar region, and the question of epulis raised. The deciduous molars were in position and carious, and roentgenograms revealed normally developing bicuspid germs with the first permanent molar apparently retarded and a space between it and the bicuspids. The child was referred through surgical and otolaryngologic clinics and then to the dental service for extraction of the carious deciduous molars. There is no mention in the records of the growth, the supposed epulis having been removed. At the age of 8, roentgenograms showed the first permanent molar in fair position close to the bicuspids but not yet through the gingival tissues. A diagnosis of delayed eruption of this tooth was made and an incision made, and the soft tissues were removed down to the offending tooth crown. Still, it failed to erupt, and, during the next year, both first and second molars were removed surgically with considerable adjacent bone. No change was noted and, at 10 years of age, roentgenograms revealed the absence of the first and second molars, with the third and rudimentary fourth molars developing in close proximity to the antral floor. The patient was seen again at 12 by the surgical clinic and no appreciable

4. Gerrie, J. W.: Canad. M. A. J., 29:643-645 (Dec.) 1933.

change noted. Dental opinion at that time was that the teeth played no part in the deformity of the face. The neurologic clinic believed the hemiparesis and atrophy of the facial muscles to be a surgical condition dependent on the presence of the unerupted molars and bony changes in the left upper jaw.

On admission the following year, at the age of 13, the significant findings were: swelling and puffiness of the left cheek with hemiatrophy and weakness of the anterior part of the left temporal, buccinator and masseter muscles, and absence of the left molar teeth and bony alveolar process or maxillary tuberosity posterior to the bicuspids on that side. On palpation, this area was soft and nonfluctuant and rough bony edges could be felt extending from the buccal aspect up to the bicuspids and over to and along the palatal side of the alveolar crest. Diagnosis was in question, but it was thought that there must be some cystic structure in relation to the rudimentary molar and involving the floor of the antrum. To inspection, the nose appeared normal, and there had been no complaint of nasal symptoms.

Flat roentgenograms (Fig. 12, above) showed a markedly cloudy left antrum with the impacted molars in close proximity to the antral floor. The three other third molars were not yet erupted and there were two labially impacted cuspids. Lavage of the antrum produced a frank pus; which meant that here was a chronic suppurative sinusitis the symptoms of which had escaped the patient's notice. Lipiodol was injected into the left antrum and the roentgenograms (Fig. 12, below, left) indicated a marked polypoid condition. The impacted teeth encroached on the posterior part of the antral floor, but there was no outline indicative of cystic involvement. In an effort to prove or disprove the presence of a cyst, three hypodermic needles were passed in different directions through the suspected alveolar area (Fig. 12, below, right). Their passage required considerable force. They encountered no fluid, but bony antral wall or tooth structure in each direction.

The differential diagnosis was interesting. Chronic antral suppuration and antral polyposis had been positively diagnosed. An impacted third and probably rudimentary fourth molars were present. Sarcoma was obviously excluded by the long-standing, nonprogressive history. Because of the presence of dental anomalies in the child's mouth, the roentgenograms showing impacted upper cuspids and the remaining three third molars developing as if impaction were imminent, it was felt that some dental anomaly was present in the left upper jaw. A dentigerous cyst associated with the rudimentary fourth molar seemed the logical conclusion. Needle puncture ruled out the presence of any cystic fluid and to the touch the area felt fibrous. Because of the previous operative procedures in this region, it was thought that postoperative healing processes might have modified a cystic structure, if present.

With the positive diagnosis of the jaw condition still a matter of conjecture and intervention in the antral condition indicated, it was decided to perform a radical antrotomy and then proceed with the alveolar condition on the findings along the antral floor. A left Caldwell-Luc antrotomy was performed. An impacted cuspid lay in the line of approach and was removed. The antrum contained free pus and was polypoidal. The floor was intact and essentially normal except that the third and fourth molar roots, covered by a thin layer of bone, projected almost a quarter inch into the posterior part of the cavity. The floor was left intact. After removal of the mucous membrane and the making of the intranasal opening, the incision was extended backward, downward and medially over the suspected alveolar area. Immediately, a white hard fibrous structure came into view. With some difficulty, this was dissected back and found to be associated with the crowns and necks of the impacted teeth. These were pried loose from their sockets, the antral floor being left intact, and tumor and teeth removed *en masse*. The bony tuberosity was completely gone. Profuse bleeding in the pterygomaxillary fossa was controlled with gauze pressure. The

tumor cavity was packed lightly with iodoform gauze brought out well back in the alveolar area and the intervening tissue between this and the antral opening was sutured snugly and the Caldwell-Luc incision closed. Light iodoform packing was carried into the antrum via the nose and removed the following day. The object was to keep the mouth and nose cavities separate and encourage the intact but surgically damaged floor to remain intact. Fortunately, it did so and the mouth wound granulated slowly, no fistula becoming evident at any time.

The specimen (Fig. 13) was a fibrous mass about 2 inches in length, with tooth crowns embedded by pressure only. Section showed hard white fibrous whorls, which microscopically proved to be fibrous tissue only.

In retrospect, I think this operation would have been theoretically sounder if the antral condition had been tended to first, and the alveolar growth removed after an interval of several weeks. First stripping the antral mucosa from above and then the tumor from the alveolar side, as was done, must have greatly jeopardized the life of the bone between the two cavities, the antral floor. However, the alveolar condition was undiagnosed, and once the incision was made, the fat was in the fire. Fortunately, Nature and a measure of good luck came to our aid.

CONCLUSIONS

1. Pathologic conditions in the upper alveolar process contribute roughly an interesting 20 per cent of the cases of maxillary sinusitis submitted for treatment. These follow largely surgical procedures within the mouth.

2. Alveolar abscess is seldom a demonstrable cause of sinusitis.

3. Removal of upper teeth is often impossible without severe damage to the antral floor.

4. The curet should be used gently and with caution in enucleating granulomatous areas in this region.

5. Large areas of alveolar bone should never be removed in an effort to locate a root tip, the buccal flap route being that of choice.

6. Both patient and rhinologist should be informed if a root tip remains in the antrum or on the antral floor.

7. Free socket dressings are dangerous in the presence of antral fistula.

8. Fractures involving the antrum are usually followed by a chronic sinusitis.

9. Soft and organic foreign bodies produce an acute suppurative sinusitis, metallic ones a chronic irritational type.

10. Development of oral fistulas is to be avoided, and they should not be used as a route of sinus irrigation.

11. Both malignant and cystic conditions should be diagnosed and treated early.

SOME OF THE FALLACIES ASSOCIATED WITH THE ADMINISTRATION OF LOCAL ANESTHESIA*

By EDWARD REITER, D.M.D., M.S., Cleveland, Ohio

H. W. HAGGARD, professor of physiology at Yale University, tells a story to illustrate the commonest error of human reasoning.

The story, which applies very generally to popular views on the use of local anesthesia in dentistry, has to do with the famous biographer Plutarch, who wrote "The Lives of Illustrious Greeks and Romans." His work has survived nearly 2,000 years. He was a man of scholarly attainments; he knew Latin and Greek better than any modern student, and he had first hand knowledge of ancient history, literature and philosophy. He had a classical education, but with it all he could not reason logically in matters pertaining to health and disease. In his "Life of the Roman Emperor Vespasian," he tells of the incidents in the capture and execution of Julius Sabinus. Sabinus led a revolt on Gaul and was defeated by the Roman Army. He fled and hid with his wife in a cave. For a period of nine years he lived there in constant fear of capture, for throughout all of that time the Romans sought for him. Finally, he was discovered and captured. He and his wife, with the children that had been born to them, were then taken to Rome. They were brought before the Emperor Vespasian, who decreed that Sabinus must die. On hearing that sentence, the wife with one child at her breast and another by her side, knelt before the Emperor. Her plea was not for mercy, but merely to ask that she and her children might suffer the same fate as her husband. The Emperor Vespasian was not moved to pity by this act of devotion. Instead, he granted her request and accordingly the entire family was executed.

Now Plutarch in commenting on the incident makes the following observation: "In all of the long years of the reign of this Emperor, there was no deed so cruel or so piteous to see; and he, Vespasian, was afterwards punished for it, for in a short time all of his posterity was extinct."

Now, such a conclusion as that could never have been drawn by a man who thought logically. It emanates from sentiment and is an opinion based entirely on emotion. It is not logic. Two events occur: 1. The Emperor Vespasian is cruel. 2. His relatives die off. One follows the other. But the fact that one event follows another is no reason for believing that there is any connection between the two.

The man who thinks logically, who is trained in the principles of science, sees in this situation merely some facts without relation to each other and not enough facts upon which to base a logical deduction. He says: "This is an uncontrolled experiment. Vespasian's relatives might have died just as quickly even if he had spared Sabinus. As it was, they probably died prosaically of overeating or over-

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drinking, or else from catching cold sitting on the stone seats of the arena. To establish any relation between Vespasian's act and the death of his relatives, we would have to repeat the experiment. That is, carry out the performance once more, the same in every detail except one: Let Vespasian spare Sabinus and then see if his posterity lived any longer. That, of course, is now impossible, so the logical man says merely that Vespasian did so and so. Later, his family died out. He leaves it for the illogical man to supply the interesting but unsound relation between the two occurrences.

Our age looks back with amused contempt at Plutarch's illogical conclusion, but have we the right to sneer? Despite the advancements that have come to us through centuries of experience, many of us today think pretty much as Plutarch thought 2,000 years ago. There is in our daily press, and on the radio, and everywhere else about us, an abundance of indisputable evidence that most people of today still commit errors of reasoning, particularly in matters that are of vital importance to them and in which they are frequently called on to make important decisions.

Take local anesthesia, for example: Local anesthesia is freely charged with most of the complications that arise in and about the oral cavity. When a cellulitis or severe postoperative pain follows the extraction of a tooth, the complication is invariably attributed to the application or use of a local anesthetic solution. Here is a specific instance.

A man, aged 28, had a maxillary bicuspid removed under local anesthesia. A small quantity of procaine was applied buccally through the muccobuccal fold and expelled onto the maxillary process directly above the tooth apex. On the palatal surface, a few drops of the solution was introduced into the tissues midway between the gingival border and the median line. Profound anesthesia was quickly induced and the extraction completed with but one application of the forceps. Because no damage was done to the surrounding or investing tissues, there was no apparent reason for the development of a complication such as followed in the wake of this relatively simple extraction. But, in less than forty-eight hours after the tooth was removed, the patient developed a violent cellulitis. The swelling spread so rapidly that it soon involved the whole left side of the face, extending downward into the cervical region and upward toward the orbit.

When the patient's temperature reached a point above 102 degrees, the inflammatory process became localized and drainage was established intra-orally. For two or three days after this operation, the patient rallied and his condition was somewhat encouraging. On the fourth day, he had a relapse, and the situation grew quite alarming. A large fluctuant abscess developed and now localized extra-orally. This was opened and much foul greenish pus was evacuated. For a brief time after this second operation, the patient remained quiet and perfectly rational, but, on the following morning, he became delirious and so restless that he had to be restrained. Later in the day, he fell into a semicomatose condition and death occurred that night.

The death of this young man was promptly ascribed to use of the anesthetic. Everyone immediately connected with the case, including the family physician, assumed that this violent infection had its origin with the injection of the anesthetic solution. The conclusion is not a logical one. The assumption, like Plutarch's, is an opinion based entirely on emotion, not logic. In this case, as in Plutarch's story, there were two events: first, procaine is administered for the purpose of extracting a tooth; secondly, a serious and fatal infection ensues. One follows the other. But here too, the fact that one event follows an-

other is no reason for believing that there is any connection between the two.

Isn't it possible that this complication occurred despite use of the anesthetic, and not because of it? And isn't it also possible that this virulent infection would have developed even if a local anesthetic had not been administered? I shall try to answer both of those simple questions by citing briefly the history of another case:

A young man, aged 21, in apparently good health, developed an acute infection in the floor of the mouth soon after the extraction of a mandibular cuspid. The mouth, prior to the extraction, gave every indication of being healthy and normal, and the tissues, immediately after the extraction, bore no evidence of undue mutilation. Two days after the tooth was removed, the whole floor of the mouth and the front of the neck became involved in a hard brawny indurated inflammation. Within the mouth, this phlegmonous inflammation extended underneath and on both sides of the tongue. After twenty-four hours had elapsed, the edematous area rose above the level of the teeth and pushed the tongue upward toward the palate, so that movement of the tongue became extremely painful. There was an excessive drooling of saliva, and breathing became somewhat impaired owing to an extension of the edema back to the pharynx. Underneath the chin, the hard brawny swelling involved all of the sublingual area. The patient's condition became quite serious and grew progressively worse in spite of every heroic measure that could possibly be instituted. Death occurred ten days after admission to the hospital.

The death of this boy could not be attributed to local anesthesia because a general anesthetic was administered at extraction. It is cases like this that provide us with conclusive proof that a violent infection can arise within the oral cavity in spite of the anesthetic and not because of it. In a small percentage of cases, infections will occur in and about the mouth in spite of every precaution that the operator may take; and such infections may at any time spread to the adjacent or nearby tissue planes to produce an acute diffuse cellulitis. In most instances, there is no relationship between the complication and the anesthetic administered.

This is a truth which the average layman does not readily grasp because, fundamentally, his knowledge of infections is more or less limited. He knows practically nothing about the virulency of pathogenic bacteria or the ability of the host to combat the invading organism. Consequently, it is not at all easy for him to rid his mind of the notion that local anesthesia is responsible for the complications when a serious infection does develop. He makes the mistake that Plutarch made in that he draws an illogical conclusion from the two events: the injection of the anesthetic solution and the subsequent complication. One follows the other. After it, therefore, he reasons, and because of it.

This habit of drawing false conclusions must be deeply ingrained in human thinking, for it crops up in nearly every complication that arises within the oral cavity. In postoperative pain, for example, there is a widespread and persistent belief that local anesthesia is responsible for the patient's distress. Not long ago, I saw a patient who suffered a most excruciating pain after the removal of a mandibular first molar. The pain was neuralgic and extremely harassing to the patient, and it persisted for a period of fourteen days. Because a solution of procaine was used to anesthetize the area, the patient believed that the anesthetic caused the extreme pain. But the mere belief in a thing is by no means a proof of its truth. At extraction, the tooth had fractured at a point below the alveolar margin and, in the attempt to remove the broken root fragments, the forceps were

applied over the soft tissues and also over the buccal and lingual plates of bone. The soft tissues were literally chewed away, the mangled bone structure being exposed to the fluids of the mouth. There was neither swelling nor edema present, but the ragged, macerated wound had fragments of crushed bone tangled in its soft tissues. The inner walls of what originally was a tooth socket were devoid of cicatricial tissue and their ugly grayish hue gave them the appearance of a necrosed surface bone.

The extreme pain in this case was due to the injudicious use of instruments during the extraction, and not, as the patient believed, to the use of the anesthetic solution. Local anesthesia is responsible for postanesthetic pain only when the area anesthetized is injured by a faulty administration of the anesthetic.

When, for instance, a needle is introduced into the buccal submucosa, or into any dense structure in the mouth, it immediately traumatizes the tissue through which it passes. As the needle pierces the tissue, it produces a certain amount of cutting and tearing that cannot possibly be avoided; and the lumen of the needle opens, not into a cavity waiting for the injected solution, but rather into a dense mass of vital and sensitive tissue. This makes a well of a solution, surrounded by torn and bleeding surfaces, open blood channels and lymph spaces. The injury to the tissues thus injected is, of course, not extensive enough to be apparent to the naked eye.

There is no visible laceration nor mutilation of tissue, that is true, but some injury is present nevertheless. No person, no matter how skilful he may be, can pass a needle through approximately 3 mm. of dense submucous structure, and, in addition, flood that region with an anesthetic solution, without disturbing the tissues so injected. Some degree of pain is therefore inevitable; and local anesthesia, or rather its injudicious application, is directly responsible for the patient's distress.

But local anesthesia is never responsible for postoperative pain when the area anesthetized is free from promiscuous or indiscriminate needle punctures. In the zygomatic or tuberosity region, for example, the patient experiences no postanesthetic pain because there is practically no tissue injury anywhere in the whole procedure. The needle pierces the muccobuccal fold at a point directly above the apex of the third molar, or at any conveniently accessible point posterior to the third molar. At the point of insertion, the needle passes through a very thin elastic mucous membrane of limited sensibility and its passage leaves no injurious nor ill effects. From the point of insertion to the point on the maxillary process, where the solution is finally expelled, the needle rides gently over the posterior lateral curvature of the tuberosity without piercing or penetrating any other tissue. The patient is completely free from pain because anesthesia is established without damage to the dense submucous tissue immediately adjacent to the teeth.

This point is perhaps better illustrated in mandibular anesthesia, which is generally induced by the expelling of a solution at the inferior dental foramen. This procedure, as we all know, is a relatively simple one, accomplished by first passing the needle through the extremely thin mucous membrane of the retromolar fossa. Because the tissue at this point has a limited sensibility, a fine gaged short beveled needle can be passed through it painlessly. Now, as the needle advances from the surface mucous membrane to the ramus, it pierces or penetrates only a few strands of loose connective tissue. There will be very little, if any, postanesthetic soreness at this point because

penetration can be accomplished without damage to the tissue through which the needle passes. After contact with the ramus has been established, the needle from that point on rides gently over the surface of the ramus until it arrives at the inferior dental foramen. Here, the solution is expelled in close proximity to a large nerve trunk and not into a dense mass of tissue. This will induce anesthesia as far forward as the median line without injection into either the buccal or the labial tissues. Long buccal injections are never a necessary adjunct. This means no cutting nor tearing of the dense submucous structures adjacent to the teeth; and it means also that we will in no way disturb the circulation to the part anesthetized, nor interfere artificially with the vitality of the tissue cells. In other words, it means no postanesthetic pain. If pain should arise after the judicious administration of a local anesthetic, the patient's distress is due to something other than the anesthesia.

This is a fact with which we are thoroughly familiar, but of which the patient as a rule has no knowledge. He does not know that the circumference of the roots of many teeth may be, and often is, greater than the necks of those teeth; and that, in many instances, their removal from the alveolus cannot be accomplished without some bone displacement; or perhaps without fracturing at the point of greatest resistance to the roots. When, as is often the case, the fractured segment of the alveolar plate is removed with the tooth, the margins of the lacerated gum tissue collapse into the socket, and thus normal retention of the protecting blood clot is lost. The patient does not know that the formation and retention of a sterile blood clot in all sockets of extracted teeth is vitally important. He does not know that it is the absence of a normal blood clot that frequently causes a great deal of his postoperative distress.

These are truths with which the patient is not acquainted, and hence it is not at all strange that he should fall into the error of blaming local anesthesia for his postoperative pain. Because the pain follows the injection of the procaine, he believes that the anesthetic is responsible for his distress. Here again, you have the type of argument that Plutarch used: After it; therefore, because of it.

This is the greatest cause of human error. It is so deeply rooted in the minds of people that even intelligent and well-informed persons are frequently guilty of drawing conclusions from the same false premise. To illustrate: A prominent physician employs local anesthesia extensively in adult tonsillectomy. Occasionally, after induction, his patients develop mild degrees of shock; i.e., the face takes on that characteristic ashen grey pallor, the eyes become somewhat weary and lusterless and a cold, clammy perspiration may appear on the hands and face. These clinical manifestations are, the physician believes, due to the fact that procaine contains epinephrine or some other offending substance. Here is a man educated in the principles of science, and trained to think logically, but making the mistake to which the laity is so commonly committed.

If we believe, as this physician does, that tremor, fainting or any other mild form of shock is due to the epinephrine content or some other constituent of the procaine, we can readily prove or disprove this point by merely repeating the experiment.

Consider the person who faints after the injection of procaine and, at a subsequent appointment, has injected a solution that contains no epinephrine. Now if any untoward symptoms develop, their manifestation is obviously not due to the presence of epinephrine. After that has

been ruled out as a causative factor, we may still go on to conclude that shock is perhaps due to the presence of some other constituent of the procaine. In that event, we can, at some other time, inject a sterile physiologic sodium chloride solution and then observe its effects on the patient. If the patient faints again, we should by this time be thoroughly convinced that syncope is, in this case, due to neither the epinephrine content of the procaine nor some other factor.

Though the evidence on this point seems conclusive, let us not dismiss the question too readily. Let us assume, for the sake of argument, that local anesthesia does have an exhausting effect on the patient; that the anesthetic is responsible for the untoward symptoms that some patients exhibit after its use. If that assumption is a correct one, it is logical to expect some degree of shock every time a local anesthetic is administered to the same person. But such is not the case, as we shall readily see from the following experiment. The patient who faints after the use of procaine or discloses any signs of shock is, at some subsequent appointment, placed under a mixture of nitrous oxide and oxygen for a period of sixty seconds. While the patient is in the analgesic stage of anesthesia, a highly concentrated solution is injected into his tissues. The general anesthetic is discontinued and the patient is then kept under observation for more than an hour. At no time during this period does the patient develop even the slightest degree of shock. This, to my mind, is conclusive evidence that local anesthesia is not responsible for shock in any form.

No one yet knows what shock really is, but we do understand that it means a depression of the circulatory centers. Fainting, the trembling of the hands, cold clammy perspiration of the forehead, and all the other clinical signs that we see occasionally, are merely outward expressions of what is taking place inside the patient. The patient in shock, on examination, shows a persistently low arterial blood pressure; a concentration of the corpuscles in the capillaries, and a reduction of the alkali reserve in the blood often sufficient to amount to an acidosis. It is this decrease in alkalinity that disturbs the normal function of the tissue cells, which, in turn, is reflected on the entire organism by a fall in the arterial blood pressure. The injection of procaine will not, by itself, induce a condition of acidosis in the blood, but any strong emotional stress such as fear will express itself physiologically by an increase in muscular tone and this declares itself chemically by a greater acid production, in which no cell of the human organism can function properly. Now you all know that nearly every patient, whether he shows it or not, dreads the dental chair. The very thought of an operation in the mouth, particularly the application of an anesthetic, is more than sufficient to induce some alteration in the mental and emotional state of most persons. It is fear, then, that causes the clinical manifestations of shock and not the procaine with its adrenalin content as so many people believe. Fear, as we know, can drive a human organism with extreme intensity. It will sometimes keep the patient within the limits of normal response and at other times so overwhelm him as to suspend normal functions and reduce him to a state of complete cold prostration. The fact which is decisively in favor of this point of view is that when we succeed in controlling the emotions of the patient, we observe that he no longer develops clinical signs of shock or exhaustion.

The question that now arises is: How can the patient's fears be kept under con-

trol? First, by gaining his confidence. Though mental anxiety is the most devastating agent that we have to combat, it can be overcome by a little tact and diplomacy. We should obtain the patient's confidence before making any injection, and then bend every effort at our command to retain that confidence. We should be essentially sympathetic and tactful, and yet firm enough to be able to influence and, if necessary to control, the prejudices of the patient. In a majority of cases, it is not necessary to clothe the removal of a tooth or any other operation in the mouth with the importance of a major operation. On the other hand, a flippant attitude is no more reassuring to the patient than is the foreboding of extreme gravity. The sights and sounds of the operating room, and the conversation, if any, should be such as is calculated only to inspire confidence. The office machine should run so smoothly, that is, the teamwork of the assistant and the operator should be so nearly perfect, that the feeling of tenseness, which naturally exists, should ever be transmitted to the patient. Any uncertainty or doubt on the part of the operator should be quickly dispelled, for it may, and often does, handicap the operator. If uncertainty on the part of the operator could be concealed, it would not affect the final result; but frequently it proves to be a readily communicated feeling, obvious to others in the case and extremely upsetting to the patient.

A convincing attitude and a frankness of statement will do much to inspire a degree of confidence and, at the same time, convey the impression that we are complete master of every situation or emergency. Once we have gained the patient's confidence, every effort at our command should be made to retain it.

The most probable direct cause for a patient's apprehension is his anticipation of pain, particularly the pain of the needle puncture. All patients dread that initial needle jab. An earnest effort should therefore be made to abolish or minimize the pain of the needle puncture.

The thin elastic mucous membrane that lines the muccobuccal fold in every part of the mouth has a limited sensibility. When this tissue is stretched so that it forms a curtain of taut mucous membrane, a fine gaged, short beveled needle can be passed through it without inflicting any pain on the patient. Nothing that we do in oral operations will inspire greater confidence than an ability to pass a needle through the tissues painlessly. We can then anesthetize any region of the mouth without any hindrance from the patient; and, of course, we all know that anesthesia is easily and quickly established in both the mandible and the superior maxilla.

Let me state most emphatically that local anesthesia as it is practiced today is practically devoid of danger or complication. When a complication does develop, that it arises after the administration of the anesthetic is no indication that it is due to the use of the procaine or to its application. Getting this point of view across to the patient is our most difficult task.

When we stop to consider the marvelous complexity of the human body, we must realize how little we really know of its intricate physical and chemical reactions. What chance, then, has the average individual of assimilating the information that we wish to convey to him? He is incapable of grasping it, first, because he is not trained in the principles of science; and, secondly, because he has never schooled his reasoning to overcome his natural tendencies to err.

How then can we turn his thoughts away from speculation or mere dogmatization toward accurate observation and

logical reasoning? Simply by placing the responsibility for whatever complication may occur in the mouth squarely on the shoulders of the patient, where it rightfully belongs. We can do this easily enough by pointing out to the patient the fact that the extraction of a tooth is a variable operation.

Our experience in this field has been sufficiently broad for us to know that the enveloping bone structure, in some mouths, is dense and hyperplastic and, in some instances, so unyielding that it clings tenaciously to the tooth in spite of every effort to dislodge it. One application of the forceps or the exolever may fail to budge the tooth. The instrument is applied again and again, and, with each purchase, another portion of the root is chipped away until perhaps only its apical third remains. Such temporizing usually leads to a great deal of surgical trauma, which must result in more or less postoperative pain to the patient.

In other cases, it may be the presence of a long-standing chronic infection that prevents the formation or causes the disintegration of a normal sterile blood clot; and it is the absence of this blood clot in the socket that frequently causes a great deal of postoperative distress.

Let us direct the patient's attention to the fact that it is the character of the conditions present, peculiar to his own mouth, that causes his distress, if any. And, above all, let us anticipate the complication before dismissing the patient. Anything that we might say after the complication arises is merely an explanation, which the patient may not relish.

For example, after I have removed a difficult unerupted third molar, I tell the patient what may arise. I try to point out, without unduly alarming the patient, that he may expect some swelling, trismus and considerable postoperative pain. The pain may be more or less intense and may even extend back to the ear and simulate an earache. I even go so far as to warn the patient that he may not get much sleep the first night. When he returns the following morning for observation and I inquire as to his sleep, he usually replies: "Oh yes, doctor, I got two or three hours of sleep. It wasn't nearly so bad as you said it would be."

When I neglect to warn the patient of what may happen, he returns the following morning and, in a most critical tone, says: "Doctor, this thing hurt so all night long that I was able to get only two or three hours of sleep. The pain was most excruciating immediately after the procaine wore off. It must have been due to the procaine."

This is the error to which the average person is so commonly committed. Most people have the fatal capacity for drawing illogical conclusions about the use of procaine in the mouth, and most such deductions are based on the false premise: "After it; therefore, because of it."

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ECONOMIC ADVANTAGES TO THE GENERAL PRACTITIONER OF AN ALTRUISTIC CONCEPT OF ORTHODONTICS*

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IN approaching a subject wherein there is to be an intimate discussion for the purpose of bringing into closer relationship "economic advantages," "altruism" and the "science of orthodontia," we must be conscious of the fact that all social relationships, particularly in the United States, are entering a new phase.

We, in the profession of dentistry, are beginning to realize our true status in the relation to the rest of society. It is believed and hoped by many that this new phase of professional accountability regarding our moral duty toward public health will come over us as a great wave, succeeding the previous periods of great enthusiasm that we displayed at the announcement of a new mechanical technic. A thorough understanding of "ethics" (or "moral duty") and "altruism" (or "regard for the interest of others") would increase the value of dental health service both to us and to the patient, through the medium of our greater consciousness of our importance in the whole scheme of things.

As proof that we, as members of the profession, are capable of much enthusiasm, let us review a little of the past. In the technics and mechanics in the practice of general dentistry, each previous decade has given rise to a much greater development, and especially has the last quarter of a century been marked for great strides in many dental technics. We remember well the great landslide of promiscuous pulp devitalization and the advocacy of everything from gelatine compounds to noble metals for root canal fillings. We have seen the once universal gold crown—at least on anterior teeth—slip into near oblivion. During the initial stages of the "casting age," we made all sorts of restorations—mostly poor—from any metal or combinations of metals and by diverse and varied means. Synthetic porcelains were attempted in all kinds and locations of cavities. We have gone through the day of promising to cure all sorts of actual and imaginary physical ailments and diseases by wholesale condemnation and extraction. Prosthetics has been responsible for the development of hundreds of multigadget articulators. Through economic studies and practices, we have tried to make two dollars grow where only one grew before. Cures for the "four out of five" who have it have been as numerous as the dentifrices on the market; but through all these great fad waves, the practice and science of dentistry managed to exist and has emerged with a more or less satisfactory understanding of what mechanical technics are all about, even though many of our now standardized procedures were arrived at by the slow process of trial and error. This is the usual man-

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ner in which all health sciences have progressed and inevitable evolution and further progress decrees that even more sacrifices be made by the few in order that the many may profit.

The extensive survey made by the Committee on the Costs of Medical Care, together with the dental survey now being directed by the United States Public Health Service and those made by state and metropolitan dental societies, has awakened or is beginning to awaken within us a sense of obligation in our field of dental health service that we have never before experienced. May we all fully appreciate that the only manner in which we can hope to attack the problem of an appalling dental need is through a sincere and eternal effort at preventive measures. All other health preserving sciences are now earnestly striving toward more noteworthy accomplishments in the prevention of human physical suffering and ailments. Our attitude should be that of the Golden Rule. At last, we are beginning to understand "ethics," our moral duty, and "altruism," interest in the welfare of others.

The professional man engaged in the rendering of health service is not a dispenser of materials: ours is an intimate personal relationship not existing in any business: we are entrusted with the living human body, its health and physical welfare: we are guardians of life itself.

As dentists, we may never achieve the utopian stage in our branch of health service, but certainly the starting point is in doing our utmost in attempting the prevention of dental disease and deformities, with special reference to the child patient, since it offers the greatest possibility in life.

The Report of the Committee on the Costs of Medical Care lists several reasons that the child patient is not accepted in many dental offices, but it is difficult to conceive that any refusal to serve children is well founded. Regardless of the community in which he locates, a dentist establishes for himself a reputation in that particular community which is the one thing that feeds and enlarges his practice, determines his success or failure. Frequently, his practice is made or marred by his attitude toward the problems of the child, to which he is frequently indifferent.

The most prevalent excuse for not serving children is that they are considered to be nonprofitable patients; yet psychologists tell us that the good health and welfare of the offspring is the greatest of the eighty-three sales appeals made to man. When we pause to think of the economic status of those who practice health service for children exclusively, we readily realize that somehow, in spite of the statement and belief that child patients are nonprofitable, the pediatrician seems to get along.

Full consideration of the child as a dental patient involves *that something* in the picture which is inseparable from the science of orthodontics, which is defined by McCoy as follows:

> Orthodontics is a study of *dental* and *oral development;* it seeks to *determine factors* which *control growth processes* to the end that a *normal functional* and *anatomical relationship* of these parts may be realized and aims to learn the influences necessary to *maintain* such conditions when *once established.*

It is obvious, then, that we cannot, with a clear conscience, ignore any factor that might unfavorably influence "growth processes" or that might interfere with "normal, functional" and "anatomical relationship." Less than a serious consideration of these things is unpardonable.

If the general practitioner or the specialist desires to maintain the status

of a man of science, engaged in the ethical practice of dentistry, he must fully recognize that the health of the child patient is his greatest moral obligation. Regrettable as it is, there are many of us who shirk our responsibility through ignorance or indifference, or both, continuing to betray the confidence of child and parent who approach us with the belief that we will give honest advice and service.

The family dentist is usually the first to make contact with the juvenile patient and, a terrible but true indictment, we are reputed by the orthodontist to have a very limited vision, a limited sense of responsibility and apparently a limited desire to render honest service.

All too frequently, we do have a limited vision, through which there is revealed to us only a broken down tooth that needs to be extracted, with never a thought regarding the necessity of placing a space maintainer. We replace carious tooth structure with some material—frequently cement, which is soluble—with an utter disregard of the original mesiodistal width of the tooth. Proper maintenance of contact points worries us not at all. We are indifferent to filling material's being forced down into the soft tissues between the teeth, where it sets up an inflammation which is detrimental to the whole area. Incline planes of all restorations should fulfil all the requirements of normal occlusion instead of being Bertillion records of thumb prints. We dismiss congenitally missing teeth (if noticed at all) with the statement that "they must be somewhere," and, we regard supernumerary teeth about as seriously. It is excellent practice to take roentgenograms at about the age of 7, to determine, as a precaution, whether all permanent teeth are in the process of development. We know that this would be a practical procedure, but is it not a limited sense of responsibility that leads to our negligence? As usual, the most spontaneous alibi for shirking this obligation is that the patient won't pay for the service, the officiating dentist making up the patient's mind and deciding that he won't pay for it. And, all too often, we disregard the serious threat of exceedingly deep and discolored fissures in permanent molars and "breeze by" with the statement that we will "just wait" a while and "watch it." Then we dismiss the case as finished, with the advice that the next time he gets a toothache he come in again; which, as a rule, is several years later—for an extraction. Somehow, we have never learned the cost of procrastination in terms of dentofacial deformities. Now and then, we break off or leave in position the root of a deciduous tooth with the assurance to the parent that "it'll work out," but the country physician copyrighted this confession of incompetency fifty years ago. Be honest—urge the patient to seek a qualified dentist.

Occasionally, we refer a patient to the orthodontist, after completing all the work found necessary, only to have the orthodontist call up to tell us that the mesial surfaces of all four first molars and the occlusal surfaces of two were carious. It is very embarrassing for the orthodontist, but our abstract idea of professional responsibility is so dead that we regard the whole thing as a joke on the orthodontist, who had to lie to save *our* face.

If our sense of moral obligation to our patients was as emphatic as our sense of humor over our incompetency, we would never fail to observe closely the profile of every face and thereby detect many causes of incipient malocclusion, together with what constitutes normal balanced occlusion and normal function.

It is our business to inquire as to habits

of tongue or thumb sucking, lip biting, chin resting or other pressure habits. Along with the observance of the mesiodistal relationship of the first molars, we should also note whether the patient has that characteristic of underdevelopment of the nose and upper lip which so frequently is associated with mouth breathing and the presence of adenoids.

We should ever keep in mind the characteristics of the normal or ideal occlusion and seriously regard all caries, even though in a deciduous tooth, as a threat of malocclusion and dentofacial deformity.

As men of science, we do not know all that there is to know about dental caries, but we are fairly well convinced that, in most all instances, it is progressive, and that the next step is death of the pulp, followed by abscess, premature extraction, malocclusion and lateral strains on teeth due to malocclusion. Then, pyorrhea develops, along with systemic infection, impairment of health, loss of teeth —and dentures.

It is frequently stated that the prosthodontist who restores mastication through efficient dentures renders the greatest dental service, but what of the man who makes dentures, together with all ill-health sequelae, unnecessary?

The digestion of all starches, which have a definite nutritive value, is initiated in the mouth through mixture with the saliva, but we find many cases wherein malocclusion is responsible for food bolting.

Dentofacial deformities have been the cause of many an inferiority complex, which marred what might have otherwise been a successful life. Any manifestation of unusual interest in the patient's welfare which will result in the prevention or early correction of any of the foregoing tendencies or causes of malocclusion will instil confidence in the dentist on the part of the patient. The confidence of his clientele is one of the greatest economic assets that any professional man can have, but indifference tends to destroy confidence in the judgment, skill and ability of the dentist.

The reputation that the family dentist makes for himself when he adopts the policy of referring a patient to someone more competent, in the event he feels unqualified to render a specific service, pays handsome dividends.

Some of us who are in general practice, owing to a lack of foresight or to ignorance, reason that if a patient is referred to an orthodontist, the family will have less to spend for other types of dentistry. This is dishonest. Furthermore, the majority of specialists are able to build up a greater appreciation of the general practitioner; which will react to the economic advantage of the latter. One frequently hears of the indifference of the man in general practice to the need of specialists' services, and it is difficult to understand why dentists thus continue to work to their own advantage. The dentist who is seriously concerned with every responsibility and service, particularly for the child patient, adds to his own prestige; which is bound to prove a personal economic gain.

The lack of an altruistic concept of the science of orthodontics by the majority in general practice is unfortunate, and should be traceable to its origin. Much of the responsibility is put squarely upon the shoulders of the dental schools, which convey to the dental student that to master the science or just to be even fairly understanding of it requires much special study. As a result of this brief and discouraging introduction and this superficial treatment of the science of orthodontics by the dental schools, is it any wonder that we fail to recognize

the incipient stages of an extreme dentofacial deformity?

It is true that most of us learned that malocclusion was a very bad thing for anyone to have, but we never saw a case under treatment during the entire time that we were students of the science of dentistry.

Another reason for our appalling ignorance regarding the importance of recognizing incipient dentofacial deformities can be laid at the door of the orthodontists themselves. They have gone along in a more or less self-satisfied way, with an air of tolerance toward every commercial agency that has discredited the science to the extent of making all orthodontic treatment seem as simple a process as jacking up a wheel to change a tire. As a matter of fact, I have been given to understand that it was exactly the same thing, the only difference being the size of the jack. The real harm lies in the fact that many of us have believed it true, and have taken up the battle-cry of the appliance laboratories, ourselves recommending through published articles—illustrated with great piles of money—that the whole procedure is so simple. The advertisements of the orthodontic appliance maker read like the advertising of the jad-salts radio program—"just make *only two* simple changes in your diet and lose 3 to 5 pounds of moisture weight *alone* the first day."

All we as men in general practice have to do to become orthodontists over night is to make two simple changes in our practice—just send in an upper and lower model—and collect a large fee—that is all, if we listen to the appliance vender.

I am told by orthodontists that orthodontic diagnosis is particularly difficult for a novice and that occasionally even specialists make a mistake. I have learned, on my own solicitation, that there are extreme cases of malocclusion that grow progressively worse and that there is also a type that must be recognized as having a crucial period in which it must be treated to get satisfactory results. The next thing I am going to ask an orthodontist is, "Does this crucial period show plainly on the model, so that the appliance laboratory knows what it is all about?"

I have been further informed by orthodontists that there are several types of complicated malocclusion. In one instance, the mandible may be too long or too short; in another, the ramus is overdeveloped or underdeveloped; in another case, we may have these two types of maldevelopment or combinations of all of them in the same patient; and all of this may be even further complicated by an overdevelopment or underdevelopment of the maxilla, or the alveolus may not be in proper relation to the maxilla or the mandible. And too, the teeth may further confuse the diagnosis by just being simply crooked. But this is not all: these and other things were demonstrated to me through instruments, roentgenograms, photographs, models and diagrams. I learned, too, that not only is there a proper relation between the upper and lower arches, but also they each have a definite normal relation to the skull.

With the assurance that knowledge of all these facts is essential in orthodontic diagnosis, it has occurred to me that if we in general practice are going to treat malocclusion with appliances made from models only, and by a laboratory technician, we should at least attempt a compromise with our conscience.

Let us not be too severe in condemnation of the appliance manufacturer. He is a commercial man with a commercial man's point of view. He saw the opportunity of profit in our field of science that was being ignored by men of science with a passive indifference to consequences.

The immediate and imperative need is that we have a closer cooperation between the orthodontist and the general practitioner. No other phase of dentistry is so little understood by the family dentist and no one can so intelligently and effectively impress on our minds the importance of preventing malocclusion, with all its serious consequences, as thoroughly as can the orthodontist, since he is the only one who (generally speaking) fully understands the whole picture as he follows through from a simple start to a complex deformity.

Of course, we can appreciate the individual orthodontist's feelings in the matter as far as broadcasting these truths in his local society is concerned. Unfortunately, the specialist in any branch of dentistry feels he must be sphinxlike. If he is on the program or otherwise acts like a human being, he is accused of desiring publicity, of seeking referred cases or of being politically ambitious. In my opinion, orthodontists, as a class, are men of intelligence and broad vision, leaders in dental science and dental organizations, and I am confident that, in the whole United States, there is not one single orthodontist who will not fully cooperate with any man in general practice who conscientiously attempts the correction of a case of dentofacial deformity.

It is granted that anyone who is licensed to practice dentistry has a legal right to practice orthodontia. But has he the moral right without having first qualified himself through sufficient observation and study? It is also recognized that there are hundreds of thousands of children who need orthodontic treatment and who for various reasons, are unable to take advantage of the possibilities in orthodontics. But the same can be said of the need for fillings, dentures and all other dental work.

The St. Louis Dental Society recently completed a survey of the condition existing in the mouths of 120,000 school children, 95 per cent of whom needed dental attention and 50 per cent of whom needed orthodontic treatment. In those needing orthodontic treatment, fully 50 per cent of the need was traceable to premature extraction or prolonged retention of the deciduous teeth.

We attempt to justify ourselves in using wholesale factory appliances for correcting malocclusion by the statement that, in no other way, can orthodontic treatment be had, but the evidence bears out the fact that we are attempting to attack the problems of malocclusion over well-fortified breastworks instead of concentrating at the point of least resistance. If we come to acquire a real consciousness of our responsibility in preventing all conditions that tend to cause malocclusion, then and only then will we make creditable progress as either orthodontists or general practitioners. Prevention of malocclusion can be made as remunerative as correction of malocclusion.

In order that the family dentist may teach preventive malocclusion to his patients, he must himself be taught. Family dentists want to learn preventive dentistry, including consideration of dentofacial deformities. We want help—inspiration—renewed enthusiasm and a realization of our importance in the scheme of things.

REPOSITIONING OF THE MANDIBLE RELATIVE TO THE TEMPOROMANDIBULAR JOINT, CORRECTING CASES OF SUBARTHROSIS AND DYSARTHROSIS*

By THEODORE W. MAVES, D.D.S., Cleveland, Ohio

LIVING in a period of kaleidoscopic change, daily we come face to face with our limitations. This makes us conscious that our crown and bridge and partial denture construction is not exempt from the influences of the general situation and we recall that it has often been challenged in past years.

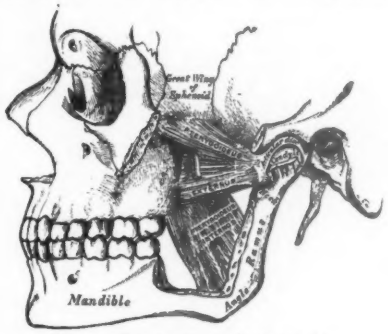

Fig. 1.—Temporomandibular joint.

Never was there a better time than now to analyze our past mistakes in bridgework, and denture construction, especially since under and about the investing tissues is conclusive evidence, microscopically and macroscopically, of the presence of disease. This obviously results in the destruction of soft tissue and bone, which is followed by loss of many of the teeth, and finally, through the years of toleration, impoverishment of the blood stream, jeopardizing resistance and the general health.

The object of this essay is twofold:

First, it is a plea to both the dental and the medical professions for a more comprehensive study of the mandibular articulation with its great importance as a basis for (1) repositioning the mandible in prosthodontia; (2) establishing a normal intermaxillary relationship in orthodontia; (3) establishing occlusal balance in all operative restoration; (4) treatment of the temporomandibular joint and reflex symptoms associated with abnormalities of the mandibular articulation.

Fig. 2.—Sagittal section of joint having two synovial cavities with articular disk between them acting as cushion.

Secondly, it is a study of the different heights of the bite pertaining to clinical, cosmetic and functional symptoms of the normal bite, and of the too highly raised bite. This section of this paper will relate to the importance of roentgenograms of the temporomandibular joint in the diagnosis and treatment of abnormalities. It will also stress the valuation derived

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from the physiologic and physical rest-position of the mandible in the closed bite and in partial and full denture construction in establishing vertical dimension.

I

Volumes have been written and published in dental literature relative to occlusion, engineering and type of designs for replacement of missing teeth in both dental arches. All of this is of great importance in dentistry, but, until recently, little stress has been placed on the importance of a more complete knowledge of mandibular articulation, i. e., establishing a normal intermaxillary relationship by repositioning the mandible. Valuable research and data have been

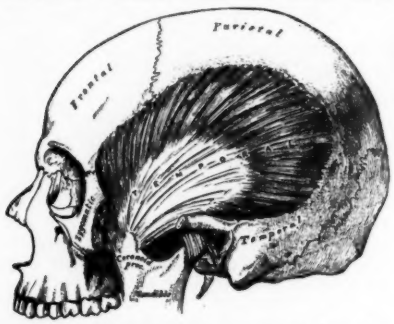

Fig. 3.—Temporalis muscle with insertion on coronoid process.

given recent publication by such men as Decker,[1] Goodfriend,[2] Prentiss,[3] Wright[4] and Cosden,[5] recognition of which is herein given. In all cases of adult restorations (closed bites and partial and full denture construction), the first and most important fundamental in diagnosis and prognosis is a complete knowledge of the temporomandibular joint and the normalities and abnormalities of the mandibular articulation, regarding: (1) the standardization of the normal; (2) the etiology of abnormalities; (3) the symptoms of abnormalities; (4) the classification of joint symptoms; (5) the procedure for the diagnosis of abnormalities; (6) the treatment of ab-

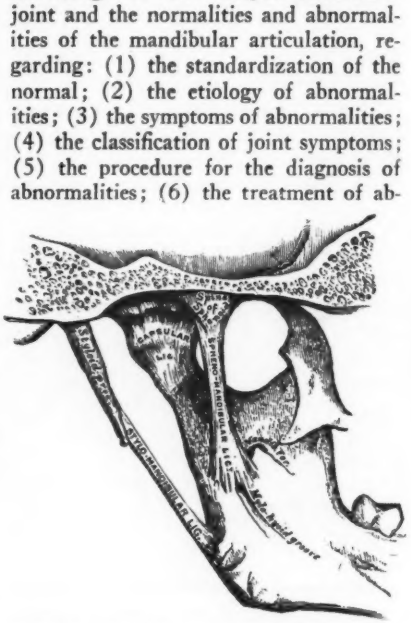

Fig. 4.—Medial aspect of articulation of mandible.

normalities, and (7) complete knowledge of the anatomic and roentgenologic structure of the joint. (Fig. 1.)

Let us briefly review the anatomy of the temporomandibular joint, regarding which we find that the teeth, especially the molars and bicuspids, maintain the intermaxillary distance with the aid of

1. Decker, J. C.: Traumatic Deafness as Result of Retrusion of Condyles of Mandible, Ann. Otol. Rhinol. Laryngol., 34:519-527 (June) 1925.

2. Goodfriend, D. J.: Symptomatology and Treatment of Abnormalities of Mandibular Articulation, D. Cosmos, 75:844-852 (Sept.), 947-957 (Oct.), 1106-1111 (Nov.) 1933.

3. Prentiss, H. J.: Preliminary Report upon Temporomandibular Articulation in Human Type, D. Cosmos, 60:505-514 (June) 1918; Regional Anatomy, Emphasizing Mandibular Movements with Specific Reference to Full Denture Construction, J.A.D.A., 10:1085-1099 (Dec.) 1923.

4. Wright, W. H.: Deafness as Influenced by Malposition of Jaws, J.N.D.A., 7:979-992 (Dec.) 1920.

5. Cosden, J. B.: Ann. Otol. Rhinol. Laryngol., 43:1-15 (March) 1934.

the muscles of mastication and maintain the normal position of the head of the condyle in relation to the glenoid fossa.

Figure 2 shows a sagittal section of joint having two synovial cavities with the articular disk between them acting as a cushion or shock absorber, and maintaining a normal relation to each part, a portion of the fibers of the external pterygoid being attached to the articular disk.

Figure 3 shows the temporalis muscle with its insertion on the coronoid process aiding in the stability of the joint and closing of the mandible.

James B. Cosden,[5] M.D., says:

The problem of temporomandibular joint function and occlusion being a major dental issue, it appears almost entirely in the dental literature. The following group of symptoms may be observed frequently in patients with edentulous mouths and a marked overbite; the syndrome is classic for lesions of the sinuses or ears; yet overbite and disturbance of the joint are so easily overlooked as etiologic factors that it becomes a source of error in analyzing cases in otolaryngology.

Conditions that have been given most attention in the medical literature are anterior dislocations, fracture of the neck of the mandible and ankylosis of the joint after chronic irritation or infection. These have received prolific comment, and appropriate surgical treatment has been carefully worked out.

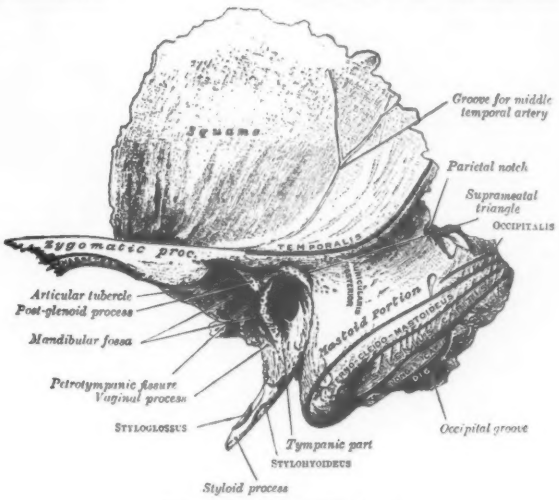

Fig. 5.—Left temporal bone.

Figure 4 shows the medial aspect of the articulation of the mandible with capsular stylomandibular and sphenomandibular ligaments.

Figure 5 represents the left temporal bone, showing the mandibular fossa, articular tubercle and tympanic portion and the close proximity to the external auditory canal, the petrotympanic or glasserian fissure, the medial end of which allows the passing of the chorda tympanic nerve.

Each of these symptoms may be ascribed to some evident disturbance in anatomic function of the joint, its ligaments and muscular attachments. The ear symptoms depend upon actual involvement of the eustachian tube and tympanic structures. The sinus symptoms are more apparent

than real. The actual source of this group of complaints was confirmed by the marked improvement which followed correction of the overbite, renewal of molar support to take pressure off the condyle, and establishment of proper articulation of the condyle within the glenoid fossa.

The ear symptoms observed were: impaired hearing, continuously, or with intervals of improvement; stopping or "stuffy" sensation in the ears, marked about meal time; tinnitus, usually "low buzz" in type; less often, a snapping noise while chewing; pain, of the dull type, within and about ears; dizziness, mild, or, again, attacks of prostrating severity, definitely relieved by inflation of the eustachian tubes.

Alleged sinus symptoms were: headache, severe and constant, localized in the vertex and occiput, and behind the ears—the typical site of posterior sinus pain, but increasing toward the end of the day (a typical sinus history, and suggestive of eye headache); burning sensation in the throat, tongue and side of the nose.

The diagnosis of this condition is established by: (1) the lack of molar teeth, or badly fitting dental plates, permitting

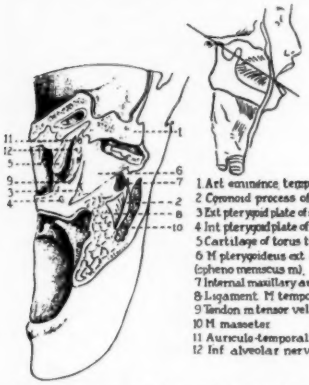

Fig. 6.—Section through articular eminence close to glenoid fossa.

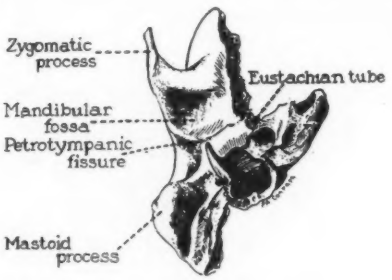

Fig. 8.—Position of zygomatic process, etc.

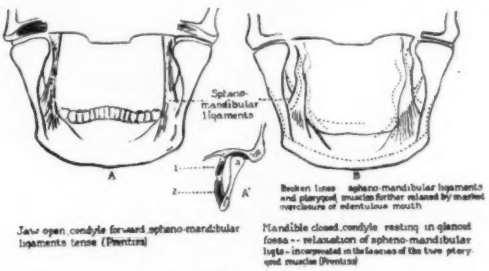
Spheno-mandibular ligaments
A
A'
1
2
B
Broken lines spheno-mandibular ligaments and pterygoid muscles further relaxed by marked overclosure of edentulous mouth
Jaw open, condyle forward, spheno-mandibular ligaments tense (Prentiss)
Mandible closed, condyle resting in glenoid fossa -- relaxation of spheno-mandibular ligts - incorporated in the fascias of the two pterygoid muscles (Prentiss)
A'-Coronal section through ramus and the two pterygoids to show sphenomandibular ligament, a part of cervical fascia. (1)Ext. pterygoid. (2)Int. pterygoid (Prentiss)

Fig. 7.—Left, joint in normal position, with external pterygoid muscle taut. Right, overacting closure of mandible by masseters, internal pterygoid and temporal muscles, shoving condyle upward against atrophic meniscus.

The diagnosis of this condition is established by: (1) the lack of molar teeth, or badly fitting dental plates, permitting

overbite; (2) mild catarrhal deafness, improved at once by inflation of eustachian tubes; (3) dizzy spells, relieved by inflation of tubes; (4) tenderness to palpation of mandibular joints; (5) marked comfort to patient from interposing a flat object between the jaws; (6) presence of the typical headache after sinus or eye involvement has been corrected and when sinuses or eyes are found to be negative.

Wright, and later Decker, reported cases demonstrating compression of the cartilaginous canal by habitual retrusion of the condyles of the mandible.

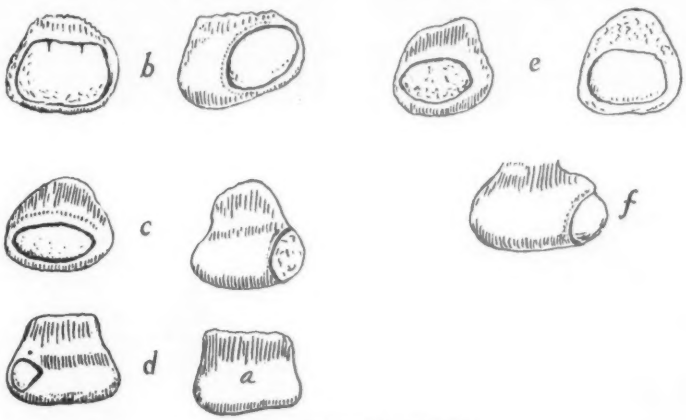

Fig. 9.—Perforated meniscus.

These authors ascribe deafness to: (1) compression of external canals to the point of closure and (2) trauma to tympanitic structures and irritation from the continued click and pound as the condyles slip backward with each closure of the mouth.

If these deductions are accepted, it would be on the basis of some type of concussion of labyrinthine structure or injury to the eighth nerve, in which case recovery of the hearing would be very slow. Such cases, as well as most of the present series, promptly improved in hearing within a few days or weeks after restoration of the occlusion. The temporary nature of such deafness seems clear. The symptoms of dizziness temporarily disappeared with the first inflation of the eustachian tubes and the hearing distance was improved during the test. The rôle of compression of the eustachian tubes and a resultant conduction deafness was quite evident; and the association of dizziness with proper regulation of the intratympanic pressure was repeatedly demonstrated.

Looking to anatomic conditions for such a pressure effect, we find a definite basis for compression of the tubes. A section (Fig. 6) through the articular eminence close to the glenoid fossa passes through the attachment of the sphenomeniscus muscle to the articular disk, and through the lumen of the eustachian tube, embracing all soft structures adjacent to the tube.

With the joint in normal position, the external pterygoid muscle is taut (Fig. 7, left) and the tensor veli palatini muscle borders the tube anteriorly on an al-

most straight line. Between these (Figs. 6 and 8) lie only connective and adipose tissue, and posteriorly, close to the tube, are the auriculotemporal nerve and the inferior alveolar nerve. If the jaw is brought upward into a position of marked overbite, the upper head of the external pterygoid muscle (called the sphenomeniscus muscle by Prentiss) is relaxed and a bundle of soft tissue piles against the tube.

In Figure 6, the tensor veli palatini muscle appears loose, this condition preventing its function in tightening the soft palate and opening the eustachian tube during deglutition. Especially during the act of swallowing, when the tensor palatini muscle usually opens the eustachian tubes, the compressing effect of the tissues on the tube from the overbite is present and prevents it.

The very looseness of the capsule of the mandibular joint and its restraining ligaments now works to further exaggerate the pushing of tissues toward the tube.

Figure 7, right, shows how, with each overacting closure of the mandible by the masseters, the internal pterygoid and the temporal muscles, the condyle is shoved upward against or through the atrophic or perforated meniscus (Figs. 9-10), or it moves backward to the tympanic plate and pushes mesially on one side or the other through the loose capsule. This happens countless times at each meal, when the patient retrudes the jaw to occlude his poorly fitting plates or bridges.

Prentiss observed that, with wide variations of thinning of the meniscus, perforations were produced on various areas. Their locations would depend on the

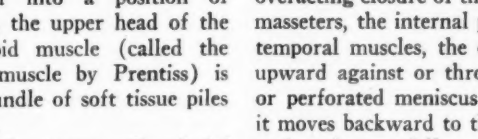

Fig. 10.—Atrophied tissue.

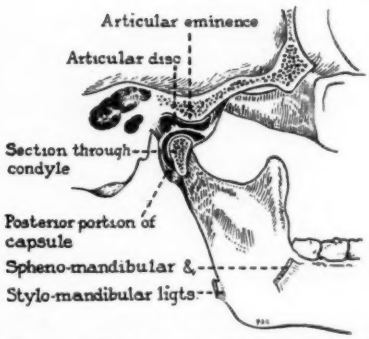

Fig. 11.—Deep erosion of bone of glenoid cavity leaving only thin plate between condyles and dura.

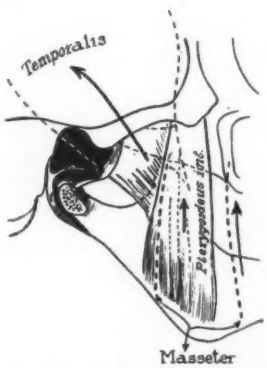

Fig. 12.—Deep erosion of bone of glenoid cavity leaving only thin plate between condyles and dura.

angle at which the condyle was forced against the meniscus. An uneven pressure follows the unilateral loss of molar support.

The overbite, with atrophy of the joint structure, occurs at once if the dental plates or bridges are poorly fitted and allow it. It develops slowly if the same plates are worn for many years, and shrinkage of the bone in the dental ridges is marked.

Goodfriend recently gave exhaustive reports on the symptomatology and treatment of abnormalities of the mandibular articulation, with emphasis on the mechanics of repositioning the mandible and establishing dental occlusion. His analysis of ninety-one cases shows that only 12 per cent of the group are aware of the joint symptoms and that the majority of them seek treatment for the associated reflex symptoms. Deafness leads the list of primary complaints, and then come, in order of frequency, bite anomalies, speech defects, snapping of joints, tinnitus and eczema of the ear canals, facial deformities, pyorrhea, malocclusion and, lastly, vertigo. Audiometric examinations were made in an otolaryngologic clinic and these showed 13.3 per cent loss of hearing for the abnormal group, but the type of deafness was not reported.

This important investigation demonstrates the following points: 1. The patient mentions deafness most frequently as a primary complaint, vertigo last, and headache not at all. (This means that the patient does not associate the two symptoms and that the vertigo is mild and recurrent over a long onset period.) 2. Treatment is sought by the majority of patients for the result, headaches and referred pains, rather than the unsuspected mandibular joint disease.

The anatomic explanation of pain in connection with disturbed joint function is fairly simple, if recognized: 1. Deep erosion of the bone (Figs. 11-12) of the glenoid cavity leaves only a thin plate between the condyles and the dura (Prentiss). Each closure of the jam impacts this evacuated area with the condyle, which thus rocks in the glenoid fossa, barely separated by the remaining thin bone from the dura and its rich nerve supply. 2. With some of the chewing movements and closures of the jaw, the condyle exerts pressure on or near the auriculotemporal nerve, which passes near the mesial side of the capsule and between the condyle and the tympanic plate to be distributed over the temporal region. (Fig. 13, left.) 3. Further, in the type of pathologic joint in which the condyle snaps backward over the articular disk, impacting and eroding the tympanic plate, the chorda tympani nerve passes this spot through the iter chordae anterius at the medial end of the glasserian (petrotympanic) fissure. (Fig. 14.)

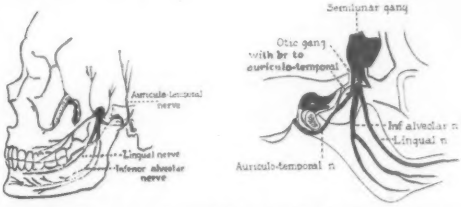

Fig. 13.—Pressure of condyle on auriculotemporal nerve.

It is therefore quite evident that a dull

vertex pain from this source may be of dural origin, that pain over the temporal region originates in irritation of the auriculotemporal nerve and that the pains referred to the side of the tongue may be attributed to pressure on the chorda tympani nerve.

SUMMARY

Headache and ear symptoms directly dependent on disturbed function of the mandibular joint frequently occur in cases showing sufficient disease about the sinuses to otherwise account for them. There are so many medical rhinologic and ophthalmologic reasons for headache distributed about the ears, vertex and occiput; and there are so many nasal changes to account for eustachian tube obstruction, that evulsion of the condyle of the mandible from overbite is not considered.

Hearing tests show a mild type of catarrhal otitis with eustachian tube involvement, usually simple obstruction. This is due to pressure on its anterior membranous wall, transmitted through soft tissue from the relaxation of pterygoid muscles and associated sphenomandibular ligaments during overbite.

The promptness with which the ears improve seems to controvert the idea that the ear condition is due to trauma or concussion of the labyrinth or tympanic structures from the condyle of the mandible. Cases of shock to the labyrinth from a blow on the chin are not within the scope of this paper.

Attacks of dizziness in these cases are obviously due to changes in intratympanic pressure affecting the labyrinth. The effect is transient and recurrent, is relieved by inflation of the eustachian tube and is not the picture seen in toxic labyrinthitis.

The areas involved in the headache cases are typical of headaches of posterior sinus origin and are easily taken for such. Persistence of the headache after indicated sinus operation is sometimes due to mandibular joint disease.

The symptoms arise as a result of overaction of the joint at first, and later the regional effect of a loose, pathologic joint is added, from absorption of the meniscus, condyles and surrounding bone.

The prognosis in a given case depends on (1) the degree that mouth restorations relieve abnormal pressure on the joint and (2) the extent of injury to the tube and to the condyle, the meniscus and the joint capsule.

Anatomic conditions are advanced to account for abnormality of the eustachian tube, and for the distribution of pain toward the vertex, occiput, pharynx and tongue. It is barely possible that mandibular joint disease may be an etiologic factor in glassopharyngeal neuralgia, the association of chorda tympani and auriculotemporal nerves with the ninth occurring via sensory connections with the otic ganglion.

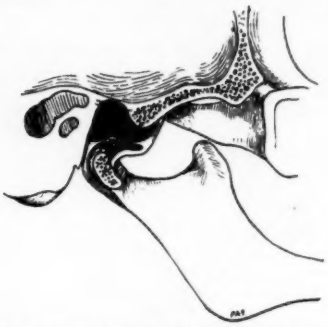

Fig. 14.—Pathologic joint in which condyle snaps backward over articular disk, impacting and eroding tympanic plate.

II

From physiology, we know that the normal conditions of an organ give rise

to normal function; also that wherever this is the case, there is the greatest possibility of attaining perfect health. To odontology, these are well-known facts. In repairing a decayed tooth through filling, inlay or crown, we endeavor to recover the normal shape in order to assure normal function. To the orthodontist, it is not merely a matter of bringing the teeth into a cosmetic alinement: in order to attain lasting results, he must also make sure that he gives the teeth such a position as to ensure normal function. Where it is a question of a full denture construction, we know that the teeth must necessarily be arranged adequately to the functions required. Thanks to the researches of eminent scientists, we have a fairly good knowledge as to how these restorations should be carried out. But in cases of partial denture construction, it may be that we allowed our interest to become limited, in that we restricted our attention to the tooth space, to some extent neglecting the prevailing conditions of the mouth in its

Fig. 15.—Roentgenographic cephalometer.

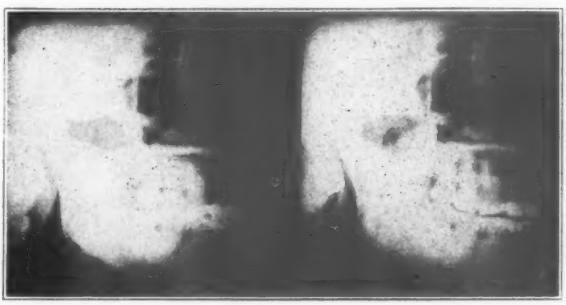

Fig. 16.—Physiologic and physical rest position of mandible of person aged 48.

entirety. If we carefully study the cause of the defects of all types of restorations, we shall see that, in most cases, the work in question was not performed with due consideration to normal function.

In full denture construction, we cannot secure normal function until we have balanced the occlusion in the presence of a normal relationship between the jaws. When teeth have been lost and we are about to replace them, we often find that because of changes, we experience difficulty in attaining functional occlusion along with the normal relationship between the jaws. Yet our aim in cases like these should be to accomplish this. Various deviations from what is normal often come under our notice, but this paper is restricted to one of the most frequent abnormalities, the closed bite.

Fig. 17.—Tracing made from Figure 13, right.

DIFFERENT HEIGHTS OF THE BITE

In full denture construction, both care and thought are required in order to attain the suitable individual height of the bite. Still more care is needed in determining the new height of the bite in the opening of the bite, if we are to ensure a lasting result.

In the following, I wish to explain to you, with a few deviations, the Planer scheme with reference to making a diagnosis of different heights of the bites. To begin with, I wish to make clear to you the two conceptions, physiologic and physical rest positions of the lower jaw. By a physiologic rest position we understand the rest position based on the tonus of the muscles of the jaw. The lower jaw hangs down from its slack muscles while the lips are closed. By a physical rest position, we understand the rest position prevailing when the rows of teeth touch each other in central occlusion. The physiologic rest position is a permanent one throughout life; whereas, the physical rest position changes with the loss of teeth, until it is finally entirely lost with the loss of the last antagonist.

The height of the bite difference between the physiologic and the physical rest position of the lower jaw is of decisive significance when there is a question of diagnosis of the different heights of the bites and with regard to this, we distinguish between (1) the normal, (2) the closed and (3) the too highly raised bite.

I wish particularly to draw attention to the fact that these expressions refer only to the different heights of the bite and should not be confounded with occlusal conditions.

The Normal Bite.—As this only means a normal height of the bite, it may be combined with different types of malocclusion. The normal bite, when combined with a normal occlusion, will arise with a perfectly ideal development of the jaws, the muscles of mastication, etc. We all recognize the look of the normal bite. From a cosmetic point of view, it lends to the face a perfectly harmonious appearance. As regards its functions, it is ideal. Muscles of mastication, and accordingly also the mastication stress, the

tongue, the cheeks, etc., all contribute by their normal functions to maintain the ideal equilibrium. The clinical symptoms show you that the physical rest position of the lower jaw has in no way been changed; also that, in this case, the rows of teeth are only slightly displaced from their occlusion, the lower jaw having acquired the physiologic rest

Fig. 18.—Physiologic and physical rest positions with old dentures in place. (Compare Fig. 19.)

Fig. 19.—Case shown in Figure 18. *B*, physiologic rest position with dentures in place. *C*, physiologic rest position with dentures out.

position. Therefore, in a normal bite, we notice the lack of height of the bite difference between the physiologic and the physical rest position of the lower jaw.

As already pointed out, the normal height of the bite may be combined with malocclusion and here we shall dwell on only one kind of malocclusion, which is of special interest to us, the more or less pronounced underhung bite which may be noticed in the normal heights of the bite. In default of a better expression, I shall call it the deep bite.

The Deep Bite.—Attempts have been made to explain how this kind of bite has arisen. It has been thought that the individual may out of convenience and habit perform mastication in central occlusion. This would probably be the consequence of unusual power of the masseter. The incisors never work in an end position and the consequence is that both the teeth and the alveolar process in the

front part are elongated. In the deep bite, the height of the bite difference between the physiologic and the physical rest position of the lower jaw is not great, or the same as with a normal bite.

Before speaking farther about the closed bite, and the bite that has been not such as may be of more immediate interest to the orthodontist.

The Closed Bite.—The causes of a closed bite are (1) abrasion of teeth and (2) the loss of teeth and in connection with this tipping, intrusion or abrasion of the remaining teeth.

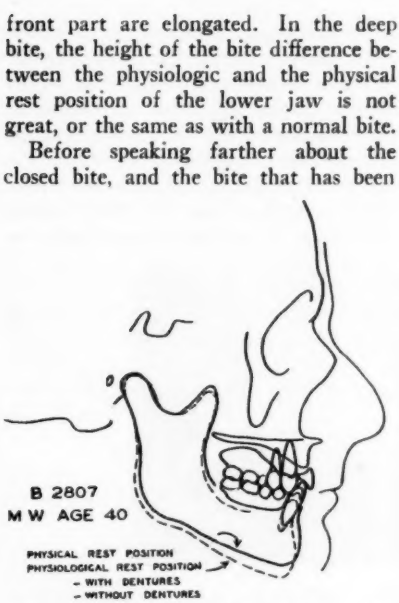

Fig. 20.—Outline drawings of Figures 18 and 19.

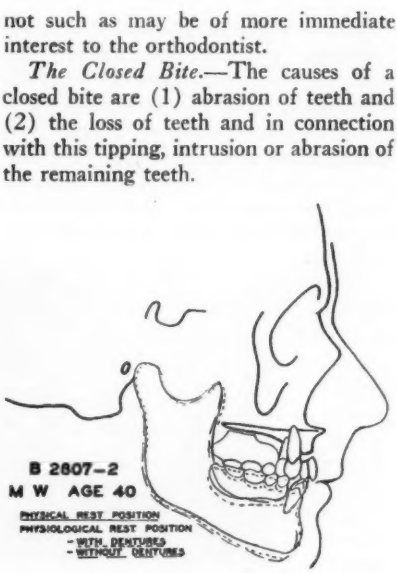

Fig. 22.—Case shown in Figures 20-21; giving outline tracing of new physiologic and physical rest position.

Fig. 21.—Case seen in Figure 20, two new partial dentures giving greater distance and new physiologic and physical rest positions.

raised too much I wish to point out that I shall go into the subject only of such changes of the height of the bite as may give rise to or may have been caused by prosthetic treatment; and accordingly

The symptoms of closed bite may be distinguished as follows: (1) cosmetic, (2) functional and (3) clinical.

Cosmetic Symptoms.—In this case, the closed bite manifests itself in changes of

the outlines of the lips and sometimes also of the chin. The lower third of the profile of the face becomes shorter and an inharmonious appearance results. The slit of the mouth becomes broader, the lips roll outward, the wings of the nose are forced upward, the nasolabial line and the line of the chin become more conspicuous and a senile expression results. As far as the appearance of the chin part is concerned, it is dependent of the position acquired by the lower jaw, while the bite has gradually become more and more closed.

Functional Symptoms.—The patient complains of fatigue in the muscles of the jaw, especially if the bite has become very much closed, and, in this case, he also finds it difficult to retain the saliva in the mouth. In addition, oral disturbances are sometimes experienced as a result of the reduced space in the mouth, a more or less developed throat trouble and difficulty in swallowing ensuing. Should the abrasion have advanced to some considerable extent, sensitiveness of the necks of the teeth and tenderness in loosening teeth follow.

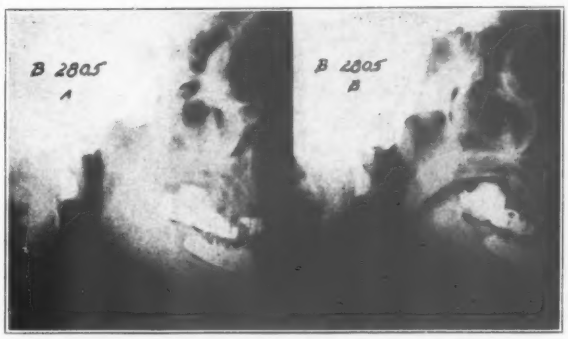

Fig. 23.—Profile roentgenograms of patient, aged 61, wearing full lower and partial upper denture; giving physical and physiologic rest positions of mandible with dentures in place.

Fig. 24.—Case referred to in Figure 23; giving physiologic rest position with dentures in place and physiologic rest position with dentures out.

Clinical Symptoms.—According to the degree of a closed bite, the height of the bite difference manifests itself between the physiologic and the physical rest position of the lower jaw. The more the bite is closed, the greater the difference between these two rest positions.

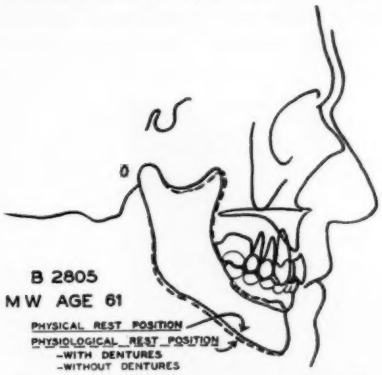

Fig. 25.—Outline tracing made from Figure 21, superimposing *A* and *B*, with dentures in position, showing physiologic and physical rest position.

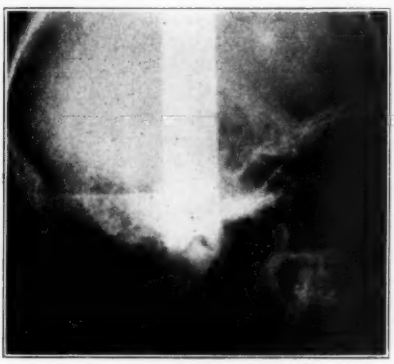

Fig. 26.—Case of subarthrosis with impingement of auriculotemporal nerve and reflexes to back of skull and neck.

The Too Highly Raised Bite.—This may have developed in consequence of the bite's having been raised too much in the construction of bridgework or in denture construction. The new height of the bite is responsible for a new physiologic rest position, and the patient is not able to establish the physiologic rest position of the lower jaw.

The symptoms of a too highly raised bite are of the same distinctions: cosmetic, functional and clinical.

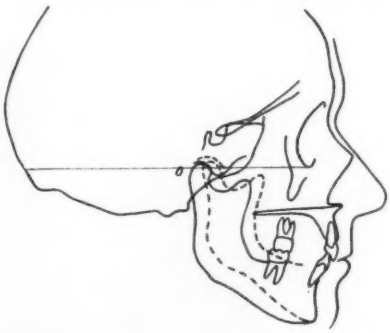

Fig. 27.—Encroachment of right condyle in base of fossa and backward against meatus.

Fig. 28.—Repositioning of mandible with gold splints.

Cosmetic Symptoms.—The patient has a stiff look about the mouth and the lower third of the profile of the face is more or less abnormally lengthened.

Functional Symptoms.—The patient complains of difficulty in biting off large bits and of constant fatigue of the muscles of mastication.

Clinical Symptoms.—The height of the bite difference between the physiologic and physical rest position of the lower jaw is equal to zero. The individual finds it impossible to get the lower jaw into a physiologic rest position because it reaches the physical rest position earlier. In speaking, the lower jaw always adopts the physiologic rest position with the teeth separated from each other, but if there is a case of too highly raised bite, the individual speaks with clenched teeth.

From a clinical symptomatic point of view, there is, as I have already pointed out, no difference between the normal and the deep bite. They must both be looked on, from a height-of-the-bite point of view, as normal bites. On the other hand, if we undertake to make the differential diagnosis between a deep bite and a closed bite, the height of the bite difference between the physiologic and physical rest position of the lower jaw will be of decisive importance. In case of only a slight height of the bite difference between these two rest positions, we have a deep bite. If, on the contrary, the height of the bite difference is a great one, it is a closed bite that we deal with. Of course, there are cases of combination of the deep and the closed bite, in which it is of vital importance to deter-

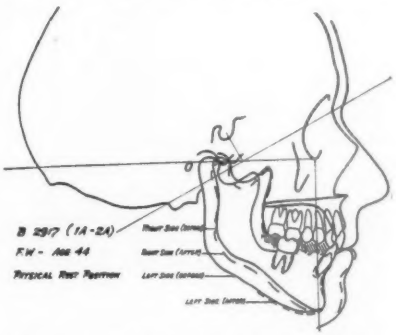

Fig. 29.—Tracing made from lateral view, showing gold splints repositioning mandible to left and forward from meatus.

Fig. 30.—Head of condyle displaced upward against floor of fossa and backward against meatus. There was soreness to pressure in right condyle region, also dysarthrosis during certain sleeping periods.

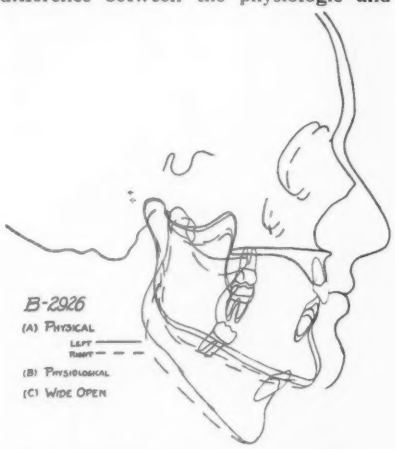

Fig. 31.—Physical and physiologic rest position to get proper vertical dimensions in repositioning mandible.

mine how far the closing of the bite has advanced, the treatment of the closed bite being dependent thereon. In determining this, the cosmetic symptoms (the outlines of the lips) are of great value. I have wished merely to give you an idea

Fig. 32.—First set of splints in position, with condyle downward and slightly forward.

Fig. 33.—Enlarged lateral view of right side, showing location of condyle.

of the different heights of the bite because I consider their symptoms valuable when there is a question of determining to what degree the closed bite should be opened.

TREATMENT OF THE CLOSED BITE

Before proceeding to the treatment of a case, it is necessary to make a diagnosis. A closed bite may, as I have already pointed out, easily be confounded with a deep bite, and therefore it is necessary

Fig. 34.—View of left side of case shown in Figure 33, with location of condyle to base of fossa.

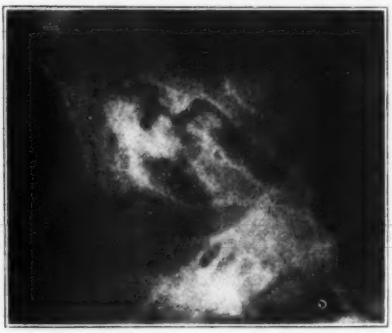

Fig. 35.—Enlarged condyle area and its position as regards glenoid fossa.

to lay down a differential diagnosis. In the case of a closed bite, this question presents itself: Should the bite be opened? In order to answer this question, it is necessary to take into consider-

ation whether there are indications or contraindications for opening the bite. I have therefore laid down the following indications and contraindications as being those which I find it important to consider.

Fig. 36.—Condyle area on left side with greater distance downward and forward, remaining within physiologic and physical rest position of mandible.

Fig. 37.—Enlarged view of left side.

INDICATIONS

The bite should be closed:

1. If abrasion has progressed to such an extent that we must be afraid that pulp irritation has already arisen or may be expected to arise.

2. If traumatic occlusion exists.

3. If there are a sufficient number of teeth remaining and their static roots are long enough to assure a lasting support under prosthetic treatment.

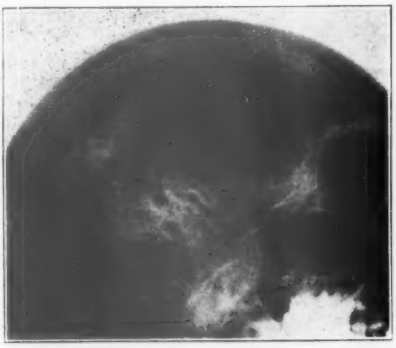

Fig. 38.—Lateral view of right side and condyle location, with second splint.

Fig. 39.—Enlarged photograph of right side, showing positioning of condyle with relief of pressure on both auriculotemporal and chorda tympani nerves.

4. If cosmetic considerations favor opening the bite.

5. If a displacement in the position of the lower jaw has caused functional disturbances.

6. If the clinical and roentgenographic manifestations reveal bone density of the hypercalcemic structure and no other pathologic conditions.

7. If repositioning of the mandible to a normal condylar-glenoid relationship is necessary for the treatment of subarthrosis and dysarthrosis.

CONTRAINDICATIONS

Closing of the bite is contraindicated:

1. If the abrasion is not a very pronounced one and has progressed normally so that traumatic occlusion has not arisen with its sequelae.

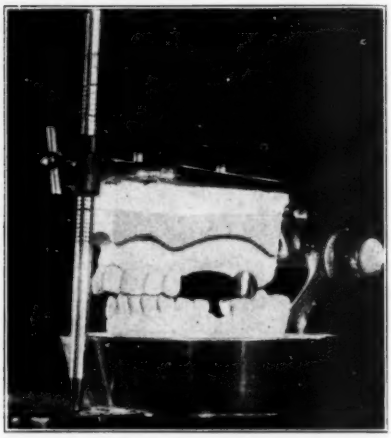

Fig. 40.—Abutments in position mounted in new centric position.

2. If an existing traumatic occlusion is not pronounced and balanced occlusion can be attained without opening the bite.

3. If a closed bite exists, but the teeth, in spite of this, work in a normal occlusion. Conditions of this kind may be due to hereditary causes.

4. If the static roots of the remaining teeth are too short to promise a lasting support when they are subjected to prosthetic treatment.

5. If the closed bite has arisen in consequence of an intrusion of all the molars and bicuspids, and the patient has accustomed himself to perform mastication in central occlusion. It is not to be expected that the patient will give up this habit after the bite has been opened, and therefore if opening of the bite is carried out, the result will only be a farther intrusion of molars and bicuspids.

6. If the clinical and roentgenographic examinations reveal a bone density of a hypocalcemic nature, when the base or foundation of the superstructure is not

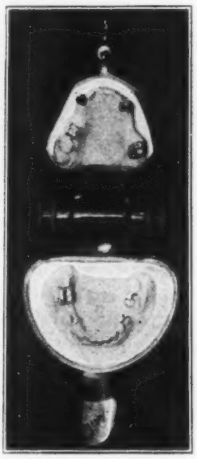

Fig. 41.—Abutments in position mounted in new centric position.

a lasting one and subject to continued change.

"Static root" and "static crown" will need some definition. By a static root, I mean that part of the tooth which has support in the alveolus; by static crown, that part of the tooth which has no support in the alveolus.

After we have ascertained that there are the requisite indications for opening of the bite and have decided to open it,

the following question presents itself: How far should the bite be opened? The answer and prognosis should be as follows: The bite should be opened to a distance with a repositioning of the mandible to assure the following: (1) normal position of the head of the condyle to the glenoid fossa, thereby avoiding and not perpetuating abnormalities of the temporomandibular joint; (2) normal physiologic and physical rest positions of the mandible, giving correct vertical dimension, on one behalf, avoiding relaxation of all muscles and ligaments, and, on the other, preventing a greater distance than the length of all muscles and ligaments can withstand and not going beyond their normal limits; (3) a normal bite height, resulting in a normal function and occlusion.

If we are to perform opening of the bite in the case of a combination of closed bite and deep bite, i.e., the underhung bite, opening of the bite to accomplish balanced occlusion is, of course, out of the question. The opening of the bite is to be made only to attain the normal height of the bite and therefore a certain amount of overbite must remain. This overbite will, from the experience I have had, not cause traumatic occlusion of the front teeth. The deep bite had, as I have already said, been caused by an individual habit of using a purely central occlusion in masticating, and it is not to be expected of the patient that he will give up this habit after the bite has been opened. In such cases, when we find contraindications in regard to the length of the static roots, I would go to the length of saying that I do not consider it necessary to open the bite to the normal bite-height.

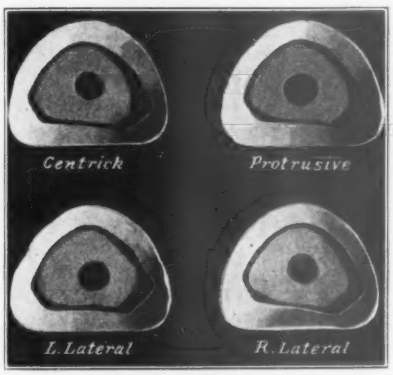

Fig. 42.—Four plaster cores made from four bites, used to construct bridges and restorations, having all four excursions of mandible represented, milled and articulated to mandible in new position, correcting abnormality of temporomandibular joint.

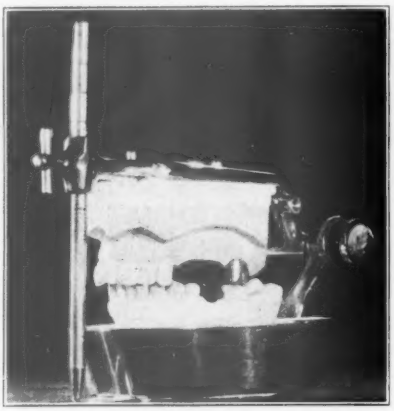

Fig. 43.—Cases mounted in right lateral position, one of four positions of plaster cores.

Figure 15 shows the roentgenographic cephalometer of the Broadbent-Bolton research with which profile roentgenograms were made, maintaining the same position of the head each time, making one exposure with the mandible in the physiologic rest position and a second exposure with the mandible in the physical rest position. Registrations of both posi-

tions were carefully recorded so as to place the head in the same position for any future profile roentgenograms.

Figure 16 displays the physiologic and physical rest position of the mandible of a person, aged 48, showing a slight separation of the maxillary and mandibular teeth in the physiologic rest position. As stated before, this distance is very slight where abrasion and loss of teeth have not prevailed and represents a normal height of the bite and normal occlusion.

Figure 17 shows a tracing made from Figure 13, right, where one plate is superimposed upon the other, giving the exact distance between physiologic and physical rest position of the mandible. As stated previously, this slight distance represents a normal condition and no closure of the mandible is present.

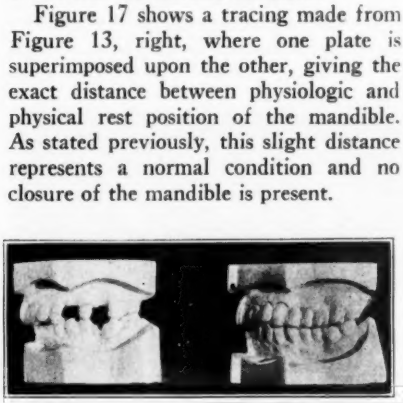

Fig. 44.—Case of subarthrosis on both sides of condyle region, before and after completion.

Figure 18 is from a patient, aged 40, wearing two partial dentures, showing the physiologic and physical rest positions with the old dentures in place.

Figure 19 shows the case referred to in Figure 18, displaying (*b*) the physiologic rest position with dentures in place and (*c*) the physiologic rest position with dentures out.

The same distance is seen in Figure 18 and Figure 16 (*b*) of the physiologic rest positions.

Figure 20 shows outline drawings of Figures 18 and 19, giving the exact distance between the physiologic and physical rest positions. This distance is considerably greater than that shown in Figure 17; which indicates that we have a closure in this case. The bite should have been opened a greater distance when the present partial dentures were made.

Figure 21 shows the case seen in Figure 20, two new partial dentures giving a greater distance, and also shows the new physiologic and physical rest positions with the new dentures.

Figure 22 shows the case seen in Figures 20 and 21, giving an outline tracing of the new physiologic and physical rest position.

Fig. 45.—Left side of case shown in Figure 44, before and after completion.

Fig. 46.—Completed cases before and after correction of subarthrosis in both, with shifting of mandible to left and forward, resulting in proper vertical dimension and restoration of normal function.

Figure 23 shows profile roentgenograms of a patient, aged 61 years, wearing a full lower denture and a partial upper, giving the physical and physiologic rest positions of the mandible with the dentures in place. There is a slight opening in the physiologic rest position of the mandible.

Figure 24 shows the case referred to in Figure 23, giving the physiologic rest position (*b*) with dentures in place and also (*c*) the physiologic rest position with the dentures out.

Figure 25 shows an outline tracing made from Figure 21 superimposing *A* and *B*, with dentures in position, showing the physiologic and the physical rest position.

Figure 26 is from the case of a woman, aged 44. She suffered intense pain from vertex to occiput and neck for fourteen years. After six years, she had all the lower right molars and bicuspids removed and later underwent resection of the mandibular nerve from the inferior dental to the mental foramen, receiving no benefit from either operation. The following six years, partial ankylosis developed, progressing until the opening closed to 6 mm. Relief, obtained only from alcohol injections, lasted from one to two months. Examination revealed a severe case of subarthrosis on the right side with impingement of the auriculotemporal nerve and reflexes to the back of skull and neck. The mandible had shifted to the right of the median line 4.5 mm. Figure 26 is a lateral view.

Figure 27 is a tracing made from a lateral view, showing encroachment of the right condyle in the base of the fossa and backward against the meatus.

Figure 28 is a lateral view after repositioning of the mandible with gold splints.

Figure 29 is a tracing made from a lateral view showing the gold splints repositioning the mandible to the left 4.5 mm. and forward from the meatus 2.5 mm. Result: Complete relief of pain after three months, at which time permanent restorations were made, maintaining the new position. One and one-half years have passed since completion, with opening of the mouth up to 19 mm. and the addition of 20 pounds in weight.

Figure 30 is from the case of a young woman, aged 21, who had undergone orthodontic treatment eleven years. In the last seven years she had had severe headaches lasting days at a time. Five years previously, an operation was performed on the skull, a section of bone on the right side being removed from above the ear to the top of the skull. The headaches continued after operation, with no apparent relief. The reason given by the medical profession for operating was that the brain was too large for skull, pressure on the nerves resulting. Figure 30 shows a tracing made from a lateral view. The head of condyle is displaced upward against the floor of the fossa and backward against the meatus. There was soreness to pressure in the right condyle region, also dysarthrosis during certain sleeping periods.

Figure 31 shows the physical and the physiologic rest position so as to get proper vertical dimensions in repositioning the mandible.

Figure 32 is a lateral view with the first set of splints in position, showing the condyle downward and slightly forward. The darkened areas on the top portion indicate where the skull operation was performed.

Figure 33 presents an enlarged lateral view of the right side, showing the location of the condyle.

Figure 34 is a view of the left side of the case shown in Figure 33, with location of the condyle to the base of the fossa.

Figure 35 shows an enlarged condyle area and its position as regards the glenoid fossa. As little relief was received from the first splints, a second set was made, giving 85 per cent relief in four months.

Figure 36 shows the condyle area on the left side with a greater distance

downward and forward, remaining within the physiologic and physical rest position of the mandible.

Figure 37 is an enlarged view of the left side.

Figure 38 is a lateral view of the right side and condyle location, with the second splint.

Figure 39 is an enlarged photograph of the right side, showing positioning of the condyle with relief of pressure on both the auriculotemporal and the chorda tympani nerves.

Technical measures for correction of abnormalities and repositioning the mandible are as follows: 1. A complete case history. 2. Lateral roentgenograms of right and left condyle areas showing deformity and location. 3. Lateral roentgenograms giving the physiologic and physical rest position of the mandibles for correct vertical dimension. 4. Splints made from roentgenograms and vertical dimension, positioning mandible for correction. 5. Lateral roentgenograms showing check-up of splints in repositioning the mandible for its proper location.

Correction of the abnormality having been accomplished with splints, restorations are now made on one side with the aid of the splint, on the other and vice versa. Four bites are taken, known as the new centric, protrusive, left lateral and right lateral. Full mouth impressions are taken and the casts mounted in the new Hall articulator in the new centric relationship.

Figures 40-41 show the abutments in position mounted in the new centric position.

Figure 42 represents the four plaster cores made from the four bites, which are used to construct the following bridges and restorations, having all four excursions of the mandible represented, milled and articulated to the mandible in its new position, correcting the abnormality of the temporomandibular joint.

Figure 43 shows the cases mounted in right lateral position, one of the four positions of the plaster cores.

Figure 44 is the lateral view of a case of subarthrosis on both sides of the condyle region; representing the right side before and after completion.

Figure 45 gives the left side of the case shown in Figure 44, before and after completion. The head of condyle was brought forward 2 mm. and down from the base of the fossa 2.5 mm., making the correction complete for the case.

Figure 46 represents completed cases before and after the correction of subarthrosis in both, with a shifting of the mandible to the left 1.5 mm. and forward 2.5 mm., resulting in proper vertical dimension and restoration of normal function.

A PROGRAM FOR POSTGRADUATE INSTRUCTION IN PERIODONTIA*

By ARTHUR H. MERRITT, D.D.S., F.A.C.D., F.A.A.P., New York City

THE science of periodontia is of so recent an origin that the dentist who graduated a dozen or more years ago received almost no instruction in this branch of dentistry. This is unfortunate, since a large percentage of the dental ills of life are the direct or indirect result of periodontal disorders. For this reason, the dentist who is not qualified to discharge his responsibilities in this field is placed at a serious disadvantage, as are his patients. To meet these obligations, the general practitioner, to whom the public naturally turns for the solution of all its dental problems, should qualify himself (1) to make a differential diagnosis of all the more common periodontal diseases, (2) to treat these diseases in their earlier manifestations and (3) to take such steps as may be necessary to prevent their development. In meeting these obligations, which is clearly the duty of the family dentist, he will not only serve his patients more acceptably, but will at the same time materially increase his practice.

One thing at least is clear in this connection; namely, that something must be done to meet the situation if the dental profession of the present is to measure up to its responsibilities. This can be done only as provision is made for postgraduate instruction. As a rule, this should be done under the auspices of the dental profession; private courses by individuals should be discouraged. Such instruction should be more or less standardized and courses arranged to meet the varying needs of the busy practitioner. In outlining such courses, it is not to be understood that they are regarded as sufficiently comprehensive to qualify one for specialization in this field, for they are not, but rather to give to the general practitioner a working knowledge of periodontia and the place which it occupies in the successful practice of dentistry.

With this in mind, the following suggestions are offered, which, with certain modifications to meet local conditions, would, it is believed, do much to solve the problem of postgraduate instruction:

1. Courses to be given in connection with a dental school where all the facilities for postgraduate instruction would be available, including infirmary practice. Under these conditions, an intensive course of one, two or more weeks could be given to meet the needs of those residing at a distance, who would naturally wish to obtain the maximum of instruction in the least possible time. Such a course should preferably be given under the direction of the local dental society, which would make the necessary arrangements for instruction with the school, including proper remuneration for the use of its clinical facilities. There could, of course, be no objection to the schools'

*Read before the Section on Periodontia at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 7, 1934.

arranging such courses on their own initiative, if they wished to do so. The chief advantage of the school course would be its comprehensiveness and the opportunity afforded for infirmary practice, which could be carried on simultaneously with the lecture course. It would have the disadvantage of being somewhat expensive in time and money and would also be subject to the convenience of the school, in order not to interfere with undergraduate instruction. If, for any reason, it seemed best, this plan could be modified by giving half day and evening courses or by limiting the courses to evenings only, provided proper clinical facilities could be had. Such a modified course would meet the needs of those residing near the place of instruction who might feel that they could not be absent from their offices for a week or more consecutively. The chief purpose of such a course would be to provide training for the practitioner who might not be able to obtain the necessary instruction in his home town and who would wish to cover the course in as brief a time as would be consistent with proper instruction.

2. For those who might feel that they could not take advantage of such a course, and there are probably many such, a briefer and, in some respects, less comprehensive course could be given in connection with any three or four day meeting. The entire lecture course could be given in this way, plus table or chair clinics by the instructor. By this plan, any state society could put on a postgraduate course in periodontia that could be made very helpful to its members, and at a minimum of expense. If the instructor were a member of the society, it could be given gratuitously as his contribution to his fellow-members; if he were brought in from outside, the expense need not in any case be excessive. Such courses could be given from time to time by different instructors and would provide an excellent background for clinical application to daily practice by those availing themselves of such instruction. The first purpose should be to make it as practical and helpful as possible.

3. Arrangements could be made to have such courses of instruction given by the local dental society in order to bring them nearer home and make them available to as many as possible. In this way, expenses could be reduced to a minimum, as the course could be carried on evenings. Small classes could be accommodated in the office of the instructor; which would have the advantage of affording an opportunity for chair demonstrations. If the class were too large for this, a suitable room could be rented at small expense. In either event, the course could be given in such a way as to afford ample opportunity for lectures, table clinics, lantern slides, questions, etc. The value of such a course could be increased if each member of the class were to take a patient into his office for gratuitous treatment during the period of instruction, such patients to be brought to the class from time to time for examination and criticism by the teacher and for the information of the other members of the class. After the lapse of several weeks, these clinic patients could be brought before a postponed meeting of the class for final examination and checking the results of treatment. For those of this class desiring more extensive training, arrangements might be made to devote certain afternoons to clinical demonstrations in the office of the instructor, where the different types of surgical operations could be shown. This would be highly desirable for training in this phase of periodontia.

By the employment of such courses as are here outlined, much can be done to

meet the need for postgraduate instruction in periodontia. Such instruction should not be given in a haphazard fashion. A more or less standardized course covering the principles of periodontia should be provided. Lantern slides illustrating every phase of the subject should be made available, and lastly, and perhaps most important of all, teachers should be chosen because of their known qualifications to give such a course. The American Academy of Periodontology has at present under consideration the preparation of such a course of study, to be illustrated by lantern slides especially selected for that purpose.

The following outline for a lecture course is offered for the consideration of those interested in postgraduate instruction in periodontia.

OUTLINE FOR POSTGRADUATE INSTRUCTION IN PERIODONTIA

LECTURE COURSE

1. History of periodontal diseases and their treatment
2. Periodontal tissues: anatomy and histopathology
   - Gingivae
   - Alveolar process
   - Cementum
   - Pericementum

   Why prone to disease
3. Common diseases of the periodontium
   - (a) Gingival recession
   - (b) Gingivitis
   - (c) Vincent's infection
   - (d) Periodontoclasia

   Features they have in common
4. Gingival recession (three types)
   - A. Atrophic type
     - (a) Description
     - (b) Etiology
     - (c) Lingual roots of upper molars
     - (d) Treatment
   - B. Abrasive type
     - (a) Differential diagnosis
     - (b) Etiology
     - (c) Treatment
     - (d) Prevention
   - C. Inflammatory type
     - (a) Description
     - (b) Etiology
     - (c) Treatment
5. Gingivitis (four types)
   - A. Simple
     - (a) Description
     - (b) Etiology
     - (c) Treatment
     - (d) Prevention
   - B. Metallic poisons
     - (a) Examples of poisons
     - (b) Importance of hygiene
     - (c) Treatment

C. Hypertrophic gingivitis
  (a) Description
  (b) Relation to pregnancy
  (c) Treatment
D. Systemic gingivitis
  (a) Predisposing diseases
    Diabetes
    Nephritis
    Agranulocytosis
    Gout, etc.
  (b) Treatment

6. Vincent's infection (two types)
  (a) Pathology
  (b) Predisposing factors
  (c) Etiology
  (d) Infectious nature
  (e) Treatment (hygiene, drugs, etc.)
7. Periodontoclasia
A. Pathology
  (a) Horizontal type
  (b) Vertical type
  (c) Histopathology
B. Etiology
  (a) Systemic factors
    Alkalosis versus acidosis
    Hereditary factors
  (b) Local factors
    Functional inactivity
    Food impaction
    Occlusal imbalance
    Tartar
    Bacteria
C. Treatment of periodontoclasia (four subdivisions)
  Local operative procedures
  (a) Examination
    History
    Roentgenograms
    Explorers
    Models
    Physical examination
  (b) Subgingival curettage
    Description of operation
    Instruments required
    Technic
    Sequence
    Possibilities of reattachment
  (c) Surgical procedures (three methods)
    Why necessary
    Description of operations
    Instruments used
    Cement pack
    Postoperative care

Balancing occlusion
- (a) Traumatic versus traumagenic occlusion
- (b) Occlusal stress versus tissue resistance
- (c) Traumatic occlusion versus occlusal traumatosis
- (d) Predisposing factors
  - Loss of teeth
  - Unequal wear
  - Malocclusion
  - Periodontal disease
  - Eruptive movement of teeth
- (e) Tissues involved
  - Pulp
  - Gingivae
  - Pericementum
  - Alveolar process
- (f) Treatment
  - Restoration of lost teeth
  - Establishment of periodontal health
  - Opening bite
  - Grinding teeth

Systemic treatment
- (a) Cooperation of physician
- (b) Blood examination
- (c) Urinary analysis
- (d) Diet, etc.

Postoperative care
- (a) Dentist's part
  - Instructions to patient
  - Brushing technic
  - Proper brushes
  - Dentifrices
  - Silk tape
  - Tooth picks or gum stimulators
  - Prophylactic treatment
  - Notice to patients
- (b) Patient's part
  - Brushings per day
  - Brushing teeth
  - Brushing gums
  - Care of brush
  - Use of silk
  - Importance of mastication

8. Periodontal abscess
   - (a) Differential diagnosis
   - (b) Etiology
   - (c) Treatment
9. Chronic desquamative gingivitis
   - (a) Pathology
   - (b) Differential diagnosis
   - (c) Treatment

10. Sensitive teeth (two types)
    (a) Surface sensitivity
        Description
        Etiology
            Granular layer of Tomes
            Interglobular spaces
        Treatment
            Formaldehyde
            Zinc chloride
            Silver nitrate
            Lime water
    (b) Thermal shock
        Description
        Etiology
        Treatment
        Use of cements
        Use of nonconducting varnish
11. Educational and economic aspects of periodontia
    (a) Education of dental profession
    (b) Education of the public
    (c) Economic aspect
12. Periodontia as a specialty
    (a) General practitioner's responsibility
    (b) Responsibility of specialist
    (c) Need of cooperation

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COLOR IN DENTISTRY*

By E. B. OWEN, D.D.S., F.A.C.D., St. Louis, Mo.

IN all the beauties of nature, color is the dominant factor. From dawn until sundown, throughout the seasons of the year, nature paints with vivid and enchanting hues the unforgettable scenes that thrill the soul of man.

It is not the purpose of this paper to deal in theories, color combinations or optical illusions. Rather, it is intended as a practical treatise on selecting harmonious colors in denture work.

It is pertinent, in the beginning, to explain the terms "hue," "color," "shade" and "saturation."

"Hue" and "color" mean the same thing, and refer to basic coloring such as "red," "yellow" and "blue."

"Shade" and "saturation" mean the same thing, referring to the various depths of a color or hue. For example, on our familiar twentieth century shade guide, Nos. 16, 20 and 21 are all yellow, but are of different saturations or shades of yellow.

Color in artificial denture work is all important because it is the basis of har-

*Read before the Section on Full Denture Prosthesis at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 9, 1934.

mony. Tooth form, arch form and individual tooth alinement are important factors, but, in my opinion, tooth color is of far more importance in that pleasing harmony which should exist between artificial teeth and the surrounding parts.

An error in the selection of a mold, or the use of a stereotyped, unvarying arch formation or an even, symmetrical tooth alinement will not be too evident if the color is harmonious; but if an "off" color has been selected, all efforts in the abovementioned steps will not produce a pleasing effect. Therefore, let us make sure that we have mastered the art of color selection.

About ten years ago, I finished a long period of research work in an effort to establish a definite means of ascertaining the exact hue and shade of tooth necessary for any edentulous case. The report was made before the National Society of Denture Prosthetists at Dallas, Texas, in November, 1924.[1] It is not necessary to cover that ground again, but I will state briefly some of the fundamental facts established in that report.

The temperamental theory, an attempt to classify mankind according to his physical characteristics, assuming that a person with certain muscular and osseous development, and certain color of hair and eyes, had teeth of a certain size, shape and color, was proved, because of the absolute inability to thus classify mankind, to have no value whatever in the selection of tooth colors.

The "try, try and try again method" of taking the various numbers from the shade guide and trying them until one is found that suits our idea of harmony is not only impracticable but also unscientific, reflecting on the profession unfavorably when we try to teach this step without a definite basis for teaching.

It was also definitely established that there are only one primary and two secondary factors that must be considered in color selection: the complexion and the age of the patient and the color of the lips, the last mentioned being least in importance. This places our work squarely on a basis of color harmony with surrounding and adjacent parts.

The fact that the complexion was the basis of tooth color having been established, an exhaustive study of the characteristics of the human complexion was begun, with many interesting revelations. It was found that there was no definite classification of complexions, other than blonde and brunet, which meant little, since the same color conditions of complexions were found in both types.

After studying the factors in the complexion, such as pigmentation, and the many conditions that influence these factors, such as sunlight, exposure to the elements and disease, an analysis of the actual component colors of the skin was begun, with the result that red, yellow, orange and blue were found in various combinations to produce complexions with four predominating colors: yellow, red, gray and brown.

A close examination, under proper light conditions, of the complexions which we see in our daily association with patients discloses the fact that they are dominated by a certain color, placing them in one of the following classifications:

Yellow, or the normal creamy flesh color.

Red, or the typical English or Irish florid complexion.

Gray, the swarthy, tawny or olive complexion so often seen.

Brown, the sun-tanned complexion of Latin-Americans, Southern Europeans

1. Owen, E. B.: Study of the Human Complexion and Means of Determining Hues and Shades in Edentulous Cases, J.A.D.A., 12: 944 (Aug.) 1925.

and many persons in our own country.

With this classification of complexions in mind, and with the idea that a certain saturation of the same colors will produce harmony, let us consider for a moment the color characteristics of natural teeth.

The late Forrest H. Orton made a thorough study of the color found in natural teeth, and one of the large manufacturers of artificial teeth has gone still farther, making an exhaustive study of this subject.

The source of coloration of the teeth is entirely different from that of the complexion. There are no definite pigment cells in the teeth. On the other hand, the color of teeth, presumably confined to the organic matter of the dentin, is an integral part of the structure, as is the color of bile.

According to Dr. Orton, there is no coloring in the enamel, but according to the findings of the manufacturer, the enamel of natural teeth is gray. Be this as it may, we find the enamel thinner at the neck and thicker toward the incisal edge; which makes the depth of coloration greater at the necks and blending into a slight grayish tint at the incisal edges. The color reflected from natural teeth is almost invariably some saturation of yellow, with a grayish tip due to a dilution of white. Rarely do we find in natural teeth any other color, except where the natural, normal coloration has been influenced by caries, fillings or other external influences. This color harmonizes perfectly with the complexion of the normal flesh, or the light creamy yellow, sometimes sprinkled with pink in the cheeks, which is the complexion of the typical so-called blonde; and since it is generally supposed that nature's purpose in putting color in teeth is beauty and symmetry, we conclude that the original type of complexion was the creamy yellow, or blonde, of which all others are variations. The color of natural teeth is almost invariable, except for a deepening of the saturation with age; while the complexion is easily influenced by grief, worry, fatigue, disease and climatic conditions. These conditions frequently cause a permanent change in the pigmentation, which accounts for the fact that we often see a clash between the natural teeth and the complexion.

ARTIFICIAL TEETH

While it required much time and research to determine the actual factors in an harmonious relationship, and more study to classify the complexions and determine the colors found in natural teeth, these things were as nothing compared to the immense amount of work necessary to produce artificial teeth with the right quality of coloring to harmonize with the various complexions; and that work is not yet complete.

The manufacturer of artificial teeth was confronted with a real problem when the dentist began to show signs of an artistic tendency and request teeth with natural characteristics. And the dentist was in a position to offer little or no help from a scientific standpoint. We knew what hues were found in natural teeth from a standpoint of casual observation, and we had some appreciation of harmony when we could find it in artificial teeth, but we did not know that red, yellow, orange and blue, in their various combinations, made these colors, and we knew still less of the exacting procedure of reproducing these delicate colors in porcelain.

Therefore, in the scientific production of artificial teeth, the first problem of the manufacturer was to isolate and recognize the different component colors in natural teeth; how they were placed in

the teeth; what in the enamel and what in the dentin; and what effect the overlay by the enamel had on the general tone of the tooth. An additional problem was the production of artificial teeth with the same characteristics as natural teeth but of different hues than any found in natural teeth, for the purpose of harmonizing them with the various types of complexions and conditions that the dentist encountered.

It was next found that the coloring materials that had been used in the manufacture of porcelain teeth in the past were not suitable for use in high fusing porcelain capable of producing the colors seen in natural teeth, and other colors desired for artificial teeth. The shades that had been produced in the past were not the result of color identification and reproduction. They were more or less empiric. The shades were not scientifically planned, and it was not possible for the dentist to go from one saturation of a hue to another, or to any other related hue by any progressive series of steps.

It was essential, after scientific study of complexions, that new teeth and a new shade guide be produced, presenting better hues, more scientifically placed than in the old teeth, and that there should be an orderly progression of shades within the different hues.

Natural teeth appear soft and beautiful instead of hard and glassy, as the earlier artificial teeth looked. Research on the part of the profession and the manufacturers revealed that this softness in natural teeth was brought about by waves, or very fine striations in the enamel, and that the surface, appearing smooth at first, was really not smooth. A perfectly smooth surface would reflect the light strongly to one point, giving a highly glossy appearance, but, with the striations, the surface presents a multitude of small surfaces reflecting light in different directions, and thereby diffusing and softening the light. It was no small task to duplicate this condition in artificial teeth, but the manufacturers have done it.

In studying the coloring of natural teeth to determine why they give such a pleasing effect, it was learned also that the upper central incisors were the lightest teeth in the arch and the incisal tips were the lightest part of the tooth, with an increasing saturation of yellow toward the necks. The lateral incisors were found to be of a little deeper saturation than the central incisors, and so on posteriorly. The lower teeth were all of a little deeper saturation than the upper. In that way, nature has developed an harmonious color scheme in the teeth. From the deep shades at the necks of the lower anterior teeth, the colors brighten toward the incisal edges, shading away again toward the necks of the upper teeth, and then into the still deeper hues of the posterior teeth.

The practical effect of this is to make the back of the mouth seem small and unnoticeable; whereas, if the teeth were all of one depth of color all the way back, the back part of the mouth would appear large and prominent, with a displeasing conspicuousness. It is possible, with the artificial teeth offered to the profession today, to produce, in some cases, the artistic effects produced by nature in natural teeth.

Practical Procedure of Matching Complexions.—Since we have established a classification of complexions, our next step is to classify artificial teeth from a standpoint of color variation and depth, and then determine which hue and saturation is most harmonious with each complexion classification.

In the study of artificial teeth as a part of this work, I have practically confined

myself, in the matter of anterior teeth, to three shade guides. The first is known as the "twentieth century" guide. In this, the colors were considered fairly good, particularly the yellow group, 5, 7, 9, 16, 20 and 21; but the labial surfaces of the "twentieth century" teeth were smooth, and the color effects were therefore bad. In view of the fact that we have more improved teeth, the "twentieth century" guide will not be further considered in this paper.

Trubyte Shade Guide.—The next guide to be considered was the "Trubyte." The colorings in this guide were the same as in the "twentieth century," but the fine striations on the labial surfaces so improved the color effects that it was used as a standard for many years and is still being used.

By examining this guide under the most favorable light conditions, we are able to isolate and classify, according to hue and shade the numbers on the guide. We find that numbers 5, 7, 9, 16, 20, 21 and 25 are all yellow teeth, the different numbers representing various saturations of the color. Shade 25 is rarely ever used. Likewise, 6, 10, 11, 12, 13, 17, 18 and 19 were gray, varying from a yellowish to a greenish gray. Of these, only 6, 10 and 11, and occasionally 13 and 19, can be used.

The first, or yellow group, harmonize very nicely with all complexions in which yellow and red predominate; while, with the second group, it was possible, in certain cases, to produce a fairly good effect, in others not so good, with cases in which gray and brown predominated in the complexion.

Judgment had to be used in selecting the saturation after the hue had been selected to match the complexion. Since the color of natural teeth deepens with age, it stands to reason that an older person would require the deepest saturation, while a younger person would require shades like 5, 7 and 16.

This classification of complexions and teeth placed us in a much more favorable position and greatly reduced the likelihood of producing disharmony. It was also the beginning of the application of science in the selection of color in artificial teeth.

New Trubyte Guide.—The fact that the complexion was the dominant factor to be considered, with a knowledge of the characteristics of complexions, more extensive study on the part of the manufacturers of the colors found in natural teeth, improved methods of placing colors and improved materials for making colors, led to the introduction of the new trubyte teeth and shade guide. The enamel in practically all of these teeth is a soft gray, corresponding to the enamel of many natural teeth, while the background or body is yellow or brownish yellow, and, in some, the background is so subdued as to give the dominant color of gray. This scheme of coloring these teeth is, evidently, in recognition of the colors found in the complexion, i.e., yellow, red, gray and brown.

In selecting shades for edentulous cases, it is first necessary to classify the patient as belonging to one of the main complexion groups, that is, to determine whether yellow, red, gray or brown is the dominant coor. There are almost infinite variations and mixtures of colors to be found, owing to the admixture of races, exposure, disease, worry, etc., but almost invariably, if the complexion is examined under the proper light conditions, the dominant color can be determined. By far the most of them will be yellow and red.

For added convenience, complexions of yellow and red are grouped under one heading, known as the yellow group, because frequently yellow and red are both so

prominently present (the red perhaps from rouge) that it is difficult to tell which is dominant. That is of little consequence since the two colors require so nearly the same hue for harmony that there is little likelihood of producing a clash.

Gray and brown, formerly grouped under one heading, but not so adequately taken care of with the earlier shadings, are considered separately because of the better opportunities of producing harmony with the newer shadings.

In examining the new Trubyte guide for distinctive colors, we find in the yellow group numbers 39 to 47, inclusive, in graduated saturations, with 57 and 58 taking care of the deeper saturations such as 21 and 25 on the old guide. That means that, when selecting teeth for a person with yellow or red dominating, we are to refer only to those numbers, and our judgment of depth will be guided by the depth of yellow in the complexion and the age of the patient.

In the gray group, shade 38 and shade 51 will be the light saturations; while 48, 49 and 50 will take care of the deeper saturations.

In the brown group will be found the least number of people, and shades 47, 57, 58 and 59 will usually take care of them. In the case of women in the brown group, when the numbers mentioned may be too deep in color, we revert to such yellows as 56 or 55.

Thus, when the patient comes in, be he blonde, brunet, redheaded or bald headed, all we have to do is determine the dominant color of the complexion, then consult the shade guide and, from the numbers harmonizing with that complexion, select the saturation consistent with age. This may require trying a few numbers before coming to a definite conclusion, but having a half dozen numbers constituting our limit is better than trying twenty-four numbers and not knowing which to try first.

Should the Number of Professional Students Be Restricted?—The medical school is in a position to judge, perhaps better than commissions, whether of the public or of the profession, regarding the quality of candidates for the profession. I believe that the best medical schools are already doing this creditably well. They are making quality the basis for admission, for advancement and for graduation from the medical school. As to admission, they are utilizing various criteria, such as grades attained by applicants in their liberal arts work, scores made in the medical aptitude test, and confidential opinions of the science professors who taught the applicants in the liberal arts college. As to advancement and graduation, they are employing examinations of both old and new types, including the promising new devices of qualifying examinations for students at the end of two years of work and of comprehensive examinations, along with other content examinations in the senior years, as a final quality test. All these academic procedures are of prime importance. But they are not enough. There remains the necessity to obtain estimates of the cultural and ethical background and outlook of the applicant for admission and of the candidate for graduation. No task facing a dean and faculty calls for more care, wisdom and humility. But undertake it they must. If we accept the doctrine of quality first, the determination of quality among candidates for the medical profession may well be left to the medical colleges. If so, there will probably be a solution of our question as to numbers in the profession—a solution that issues from the economic conditions in which we find ourselves. Financial limitations hamper every university and medical school. With stabilized income from tax sources in institutions under private control, with stabilized fees in both types, the gifts that trickle in should be assigned not for more enrolment but for more research and for improvement in teaching facilities.—Raymond Waters, in *J.A.M.A.*, March 30, 1935.

MOTTLED TEETH: AN EXPERIMENTAL AND HISTOLOGIC ANALYSIS*

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THE establishment of the fact that the presence of an excessive amount of fluorine in the water supply is the primary cause of mottling of the enamel (Smith, Lantz and Smith[1]) has made possible further experimental attacks on the problem of mottled teeth. In 1933, one of us (M. C. S.) and Lantz[2] reported on the changes in the outward appearances of the incisors of rats given fluorine by mouth (Fig. 1) or by injections (Fig. 2). In the same year, a report was made on the chemical changes in the teeth.[3] In 1934, the effect of fluorine on the rate of eruption of the incisor[4] was described.

The chief purpose of this investigation was to make a histologic analysis of the changes in the incisors of rats which were given fluorine by injection. An attempt was made to find the earliest changes that could be detected histologically and to trace their sequence.

No previous histologic study on the effect of fluorine injections on the dental tissues of the rat has been reported.

The material upon which this report is based consists of thirty-two rats from 90 to 270 days old to which were administered from 1 to 8 injections of 0.1 to 0.9 c.c. of 2.5 per cent sodium fluoride. In the experiments with multiple injections, the intervals between the latter were from twenty-four to forty-eight hours. In the experiments with single injections, the interval between the injection and death was from one to forty-eight hours. The incisors of sixteen litter mates used as controls were also studied.

The basal ration (Sherman's diet B) was composed of two-thirds ground whole wheat and one-third powdered whole milk and sodium chloride, equal to 2 per cent of the weight of the wheat.

HISTOPATHOLOGIC FINDINGS IN THE MULTIPLE INJECTION EXPERIMENTS

We shall present the findings in some

*Read at the Midwinter Clinic of the Chicago Dental Society, Feb. 27, 1934.

*From the Department of Histology, College of Dentistry, University of Illinois, and the Department of Nutrition, College of Agriculture, University of Arizona.

*This report is in part a condensed presentation of an investigation on fluorosis published in full by the University of Arizona: Schour, Isaac, and Smith, M. C.: Histologic Changes in Enamel and Dentin of Rat Incisor in Acute and Chronic Experimental Fluorosis, Technical Bull. No. 52; June 15, 1934, University of Arizona, Agricultural Experiment Station, Tucson, Ariz.

1. Smith, Margaret C.; Lantz, E. M., and Smith, H. V.: Cause of Mottled Enamel, A Defect of Human Teeth, Univ. Arizona Agr. Exper. Sta. Tech. Bull. 32, June 10, 1931.

2. Smith, Margaret C., and Lantz, E. M.: Experimental Production of Mottled Enamel, Univ. Arizona Agr. Exper. Sta. Tech. Bull. 45, Jan. 1, 1933.

3. Smith, Margaret C., and Lantz, E. M.: Effect of Feeding of Fluorides upon Chemical Composition of Teeth and Bones of Albino Rats, J. Biol. Chem., 101:677-683 (Aug.) 1933.

4. Smith, Margaret C.: Effect of Fluorine on Rate of Eruption of Rat Incisor; Correlation with Growth and Bone Development of Body, J. Dent. Res., 14:139-144 (April) 1934.

of the representative animals in detail in order to illustrate the response of the enamel and dentin to the fluorine injections.

Rat 8392.—This rat was given eight injections of 0.3 c.c. of 2.5 per cent sodium fluoride forty-eight hours apart and killed forty-eight hours after the last injection. A low magnification of a sagittal section of the incisors shows no apparent disturbances. Higher magnifications show characteristic changes in the enamel and dentin (Figs. 3-4).

Changes in the Enamel.—While the ganoblasts and epithelial papillae appear to be normal, the enamel shows a distinct stratification, which is seen in decalcified sections in the organic matrix and, in ground sections, in the completely calcified portion of the enamel. This stratification consists of pairs of layers which, in number, correspond exactly with the number of injections. Each pair consists of: (1) a light layer which represents the primary and immediate reaction to the injection and is both hypoplastic and hypocalcified, and (2) a dark layer which follows the light one promptly and which represents a secondary recovery reaction.

The width of these pairs is approximately 32 microns (Fig. 3).

The light layers arise at the incremental surface of enamel which exists at the time of the injection. They thus originate in the formative period and at the primary stage of enamel calcification. As they move with the forward movement of the tooth, they maintain a parallel course with the incremental surface of the enamel. They show a lack of ability to progress to the next stage of calcification and tend to remain in their original form in respect to calcification and appearance (Fig. 3). In sections treated with Mallory's connective tissue stain, these primary layers, in the region of the young enamel, are conspicuous by being blue in contrast to the orange stain of the adjacent enamel. In this respect, both the prismatic and interprismatic substances are involved. They also tend to maintain the picket-like arrangement. Figure 3 shows the close resemblance of the structure of these bands to that characteristic of the most recently formed layer of enamel. Tangential sections of the bands show the characteristic honeycomb network of the interprismatic substance. This network is sometimes seen in normal material in favorable tangential sections of the most recently formed enamel.

While the reaction with Mallory's connective tissue stain points clearly to an arrest in the calcification of the prisms and the interprismatic substance, evidence of a disturbance in the formation of the enamel located in the light incremental layers is not found so readily in this experiment. Some sections show, in the region of these bands, a short bend in the linear course of the prisms and interprismatic substance. These bends might be associated with slight arrests in enamel formation at the time of the injections. In ground sections, there are indications of a smaller size and a somewhat irregular shape of the globules which constitute the prisms.

That these experimentally produced incremental layers in the enamel are not artefacts is seen by the fact that they change their course in the region where enamel formation was arrested after the failure of the ganoblasts to recede. Here, the bands correspond in their course with the waviness of the enamel surface.

The pairs of light and dark incremental layers in the enamel may be regarded as characteristic of acute fluorosis. They are also found in certain other experimental conditions.

Rat 8380, which was given the same number of injections at forty-eight hour

Fig. 1.—Incisors of rats on low levels of fluorine; showing ringed appearance.

intervals as was rat 8392, but was allowed to live twenty-eight days after the last injection, showed the same characteristics in incremental stratification in the enamel and the dentin. The stratification was confined to the enamel and the dentin situated toward the incisal end of the tooth. The enamel epithelium showed a

disturbance at the level of the alveolar crest. This defect apparently occurred during the injection period, but moved forward during the month that elapsed after the injections were stopped.

Changes in the Dentin.—While the odontoblasts and the pulp appear to be normal, the dentin shows stratification, which is seen clearly in the decalcified and ground sections. This stratification consists of pairs of layers which, in number, correspond exactly with the number of injections (Fig. 4).

Each pair consists of: (1) a light layer, which represents a primary and immediate reaction to the injection, this corresponding with the light incremental layer found in the enamel, and (2) a dark layer, which follows the light one promptly and which represents a secondary recovery reaction. The width of these pairs is approximately 32 microns.

The light layers, which in decalcified sections stain predominantly with eosin, take, in ground sections, less silver nitrate and less alizarin than the adjacent stripes of dentin (Fig. 11). They may, therefore, be regarded as being hypocalcified, although there is a possibility that the calcification is disturbed in the sense that the calcium in these stripes is present in an abnormal combination.

In sagittal sections, a given light incremental layer is found to stand out with increasing prominence in respect to its inability to take the hematoxylin stain as it is traced from the posterior to the anterior direction (Figs. 3 and 4). The variations in calcification seen within the same tooth at various levels may be in part explained by corresponding variations in the proximity of blood supply at various levels of the tooth.

The blood supply of the pulp is normally rich in the posterior region and poor in the anterior region. As a given stripe of dentin moves forward, its posterior portion lies within the vicinity of a blood supply rich in calcium for a longer period than its anterior portion and is therefore subject to secondary calcification for a longer time.[5] The anterior portion lies at the very outset within the vicinity of a poorer blood supply and moves farther away from it with the eruption of the tooth. Thus, the primary undercalcified stripe lacks prominence in its posterior portion, and, similarly to the transplantation stripe of Erdheim,[6] often shows greatest disturbance in the anterior zone (Fig. 4).

The dark incremental layer stains well with hematoxylin and is well calcified. It contains faint lines of eosin-staining dentin, which are traceable to the finer substratum of stratification found in the normal dentin (Fig. 4). They are comparable to the fine rings of unpigmented enamel noted in animals on low levels of fluoride when the exposed enamel is viewed under the lens (Fig. 1).

The rhythm in calcification is disturbed so that the alternation of poor and well calcified stripes often occurs at intervals of approximately 32 microns, while the normal rhythm proceeds at intervals of 16 microns.

In Animals 8283 and 8380, which were allowed to live one month after the eight injection experiments, the dentin stripes in the form of pairs of hypocalcified and well-calcified stripes were seen as clearly as in 8392 (Fig. 4), but were, of course, found in the dentin near the incisal edge and farthest away from the pulp.

In properly chosen planes of sections, the entire experimental record may thus be read with accuracy by observing the number and position of these dentin

5. Erdheim, J.: Ueber die Dentinverkalkung im Nagezahn bei der Epithelkörperchen-transplantation, Frankfurt. Ztschr. f. Pathol., 7:295, 1911.

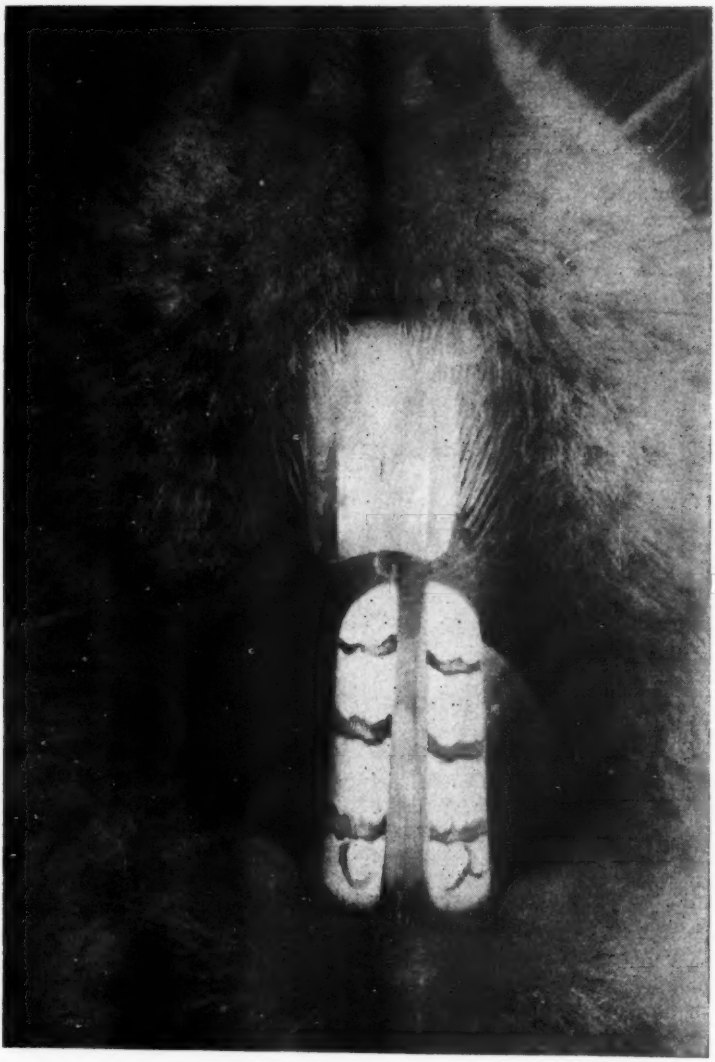


Fig. 2.—Incisors of rat given four injections of 0.6 c.c. of 2.5 per cent solution of sodium fluoride at ninety-six hour intervals.

stripes. A study of a section of enamel at the same level does not always offer the same opportunity, because enamel formation, unlike dentin formation, occurs only in the posterior region.

Rat 8808.—This animal, which was

given seven injections of 2.5 per cent sodium fluoride at twenty-four hour intervals, showed changes that were much more severe than those in corresponding experiments in which the injections were given at forty-eight hour intervals.

Enamel Epithelium.—The disturbances vary from an irregular arrangement and fusion of only the epithelial papillae to a severe alteration of the ganoblasts. In some sections, the latter were capable of laying down the organic enamel only in the form of irregular poorly staining globules.

Minute globules staining deeply with hematoxylin are found in some regions, not only in the ganoblasts but also in the stratum intermedium.

Enamel.—We can count five incremental layers which correspond in position to the time of the first five injections. The enamel formed during the last two injections was so disturbed that the prismatic and interprismatic substances cannot be recognized. The organic matrix, which is entirely unorganized, consists of an imperfect fusion of irregular and poorly staining globules.

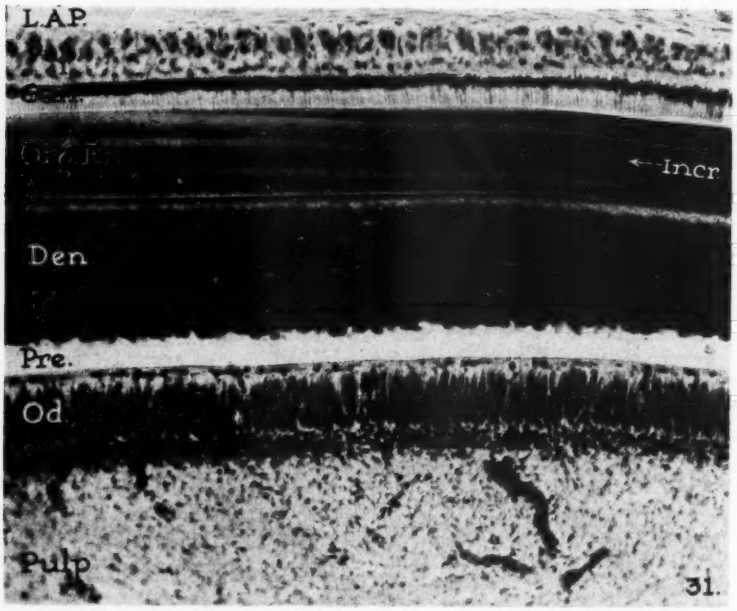
Dentin.—The response of the dentin, like that of the enamel, is typical only for the first five injections. The dentin laid down during this period is stratified, but the pairs of layers are close together and cannot be recognized as easily as in similar experiments of forty-eight-hour intervals shown in Figure 4. The dentin formed during the last two injections shows an incomplete response in that the secondary well-calcified recovery layers are absent so that there is an abnormally wide predentin portion next to the pulp. Similarly, Rat 8803, which was given six injections at twenty-four-hour intervals, also shows a lack of secondary response in the dentin laid down during the last two injections.

Rat 8410.—This animal was given four injections of 0.3 c.c. of 2.5 per cent sodium fluoride at forty-eight-hour intervals and was allowed to live fourteen days after the last injection. The roentgenogram of the upper right incisor shows the portion of the enamel which was affected during the time of the injections. This region is situated in the anterior half of the tooth because it moved forward during the postinjection period. Figures 5 and 6 show the record in the dentin. Four pairs of layers are seen in regular arrangement and sequence. Each pair consists of a primary predominantly eosin-staining stripe and a secondary stripe staining well with hematoxylin. Each pair is approximately 32 microns wide. The position of these stripes is not next to the pulp as is the case in Figure 4, but at a distance from the pulp, which equals the width of the dentin that was laid down during the fourteen days following the last injection.

In both Figures 5 and 6, we find an interesting difference between the preexperimental dentin, D_1, and the postexperimental dentin, D_3. In Figure 6, in particular, it is not difficult to count fourteen pairs of incremental layers, each approximately 16 microns wide, in the dentin formed and calcified during the fourteen days that elapsed between the time of the last injection and the death of the animal. This dentin thus shows a stratification which is normal in its periodicity, but much more accentuated than that indicated in the dentin of the preexperimental period.

Unlike Rat 8392, this animal shows severe changes in the enamel epithelium and the enamel (Figs. 7 and 8).

Enamel Epithelium.—The enamel organ is disturbed primarily in those regions which can be readily associated with the enamel epithelium that was in a highly functional stage at the time of the injections. The papillae show an irregu-



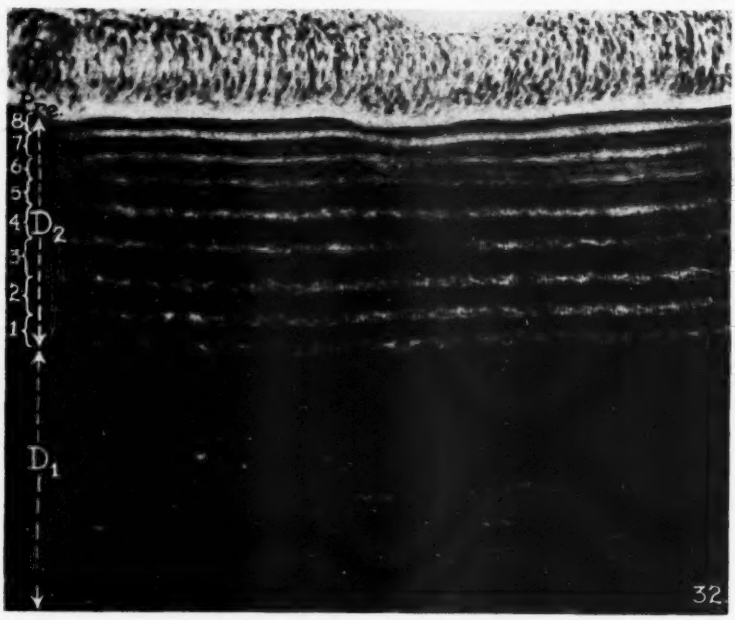


Fig. 3.—Posterior portion of midsagittal section of upper right incisor of Rat 8392. (×137.)
Fig. 4.—Labial dentin of anterior portion of midsagittal section of upper right incisor of rat referred to in Figure 3. (×137.)

lar arrangement of various types. They elongate, lose their parallel arrangement and either converge and fuse or radiate as shown in Figure 8, which also shows aborted enamel formation. In some regions, the papillae proliferate and grow out into the labial alveolar periosteum, where they course in the form of a band parallel with the enamel surface. Sometimes, near these areas of epithelial proliferation, the ganoblasts are entirely absent (Fig. 7).

Enamel globules are in some fields prominent at the surface of the organic enamel matrix.

Enamel.—In the region found to be radiolucent in the roentgenograms, the histologic sections show a persistence of organic matrix. The latter contains four pairs of light and dark layers (Figs. 7-8). Figure 9 shows a ground transverse section of the lower incisor prepared from a level farther back than that shown in Figure 6. Here, we see the experimental stratification in both the enamel and the dentin.

Rat 9146.—This animal was given five injections of 0.3 c.c. of 2.5 per cent sodium fluoride at forty-eight-hour intervals and was killed forty-eight hours after the last injection. Figure 10 shows the disturbances in the recently formed organic enamel and in the enamel epithelium. The dentin of the experimental period (Fig. 11) shows the five pairs of light and dark rings corresponding to the number and time of the injections. Figure 11 is of special interest since it shows a ground section that was stained with alizarin.

HISTOPATHOLOGIC FINDINGS IN THE SINGLE INJECTION EXPERIMENTS

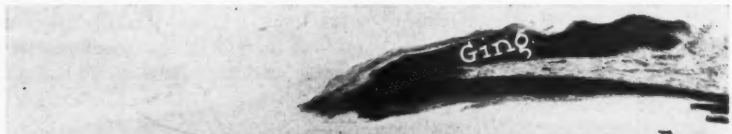
Rat 8437.—This animal was given a single injection of 0.3 c.c. of 2.5 per cent sodium fluoride and allowed to live forty-eight hours after the injection. The organic enamel in the posterior zone shows a fine light layer which takes considerably less hematoxylin stain than the rest of the organic enamel and which runs parallel with the normal developmental surface of the enamel. In Rat 9843, this line shows disturbances which are traceable to those seen in twelve-hour experiments.

The dentin shows a pair of eosin and hematoxylin staining stripes approximately 32 microns in width. The latter corresponds with the amount of dentin laid down in forty-eight hours.

Rat 8401, which received a single injection of 0.9 c.c. instead of 0.3 c.c. of 2.5 per cent sodium fluoride and which was allowed to live forty-eight hours shows changes in the enamel epithelium and the organic enamel which are similar to but more severe than those found in Rat 9874. The recovery response is absent. The dentin reaction is similar to the rest of the forty-eight-hour experiments except for the recovery layer, which in some areas stains neither with hematoxylin nor with eosin. This deviation from the typical response suggests a disturbance in the organic matrix of dentin.

Rat 9874.—This animal was given a single injection of 0.3 c.c. of 2.5 per cent sodium fluoride and killed twenty-four hours later. Its enamel is normal except in the portion formed in the last twenty-four hours. The organic enamel matrix which was formed during this period was not laid down in an orderly manner in the form of prisms and interprismatic substances, which, in the region farthest back normally give at the surface the appearance of a picket fence. The surface, instead, is irregular and covered with many hemispheric globules which stain deeply, like the organic matrix, with hematoxylin and range from 1.5 to 3.7 microns in diameter (Fig. 12).

At the region where the ganoblasts



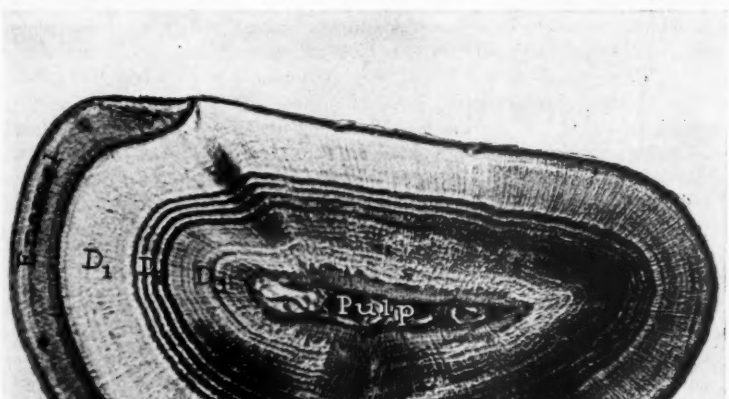


Fig. 5.—Field from midsagittal section of upper right incisor of Rat 8410. (×64.)
Fig. 6.—Transverse ground section of lower incisor of rat referred to in Figure 5. (×41.)

normally show distinct granules in their infranuclear portion, the organic enamel sometimes shows at its surface an eosin staining, homogeneous substance which was probably secreted by the cells. A beadlike row of minute hematoxylin staining globules is found on the enamel surface next to this eosin-staining substance.

The findings in this animal and others which were given single injections and killed twelve or twenty-four hours after the injection indicate strongly a disturbance in the early stages of enamel formation. In addition to the projections of hemispherical globules of varying sizes found along the incremental surface of the enamel, the ganoblastic layer contains distinct smaller globules which, with the Mallory connective tissue stain, take gradations of blue and orange (Fig. 12).

In the rats which were given single injections of sodium fluoride but were allowed to live as short a period as a single hour after the injection, the ganoblastic layer of the formative portion showed a similar abnormal character and distribution of globules.

The absence of the globules in control material that was subject to the same manner of histologic preparation and their presence in control experiments with special care in respect to proper fixation show that the globules are not artefacts.

The changes within the ganoblasts (Fig. 12) are probably related to the subsequent disturbance and arrest in calcification. These early manifestations of acute fluorosis point to the possibility of a disturbance of significant nature and are being investigated further with emphasis on the possible cytologic and microchemical changes.

COMMENT

Correlation Between Histologic and Gross Findings.—The histologic findings on the whole confirm the gross ones and help clarify their genesis.

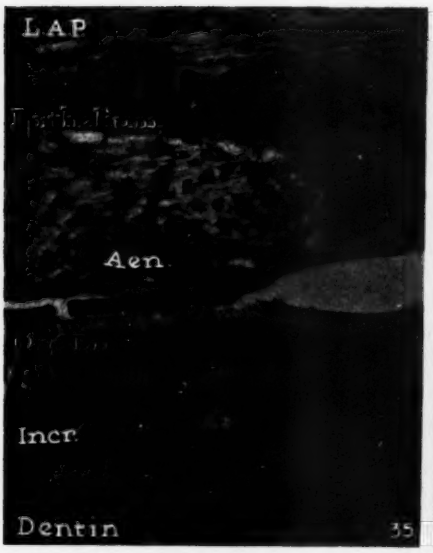
The stratification in the enamel in the form of bands with pigment and bands without pigment seen with the naked eye on the exposed portion of the enamel (Fig. 2) represents the same stratification seen in the histologic section (Fig. 3). There are three differences:

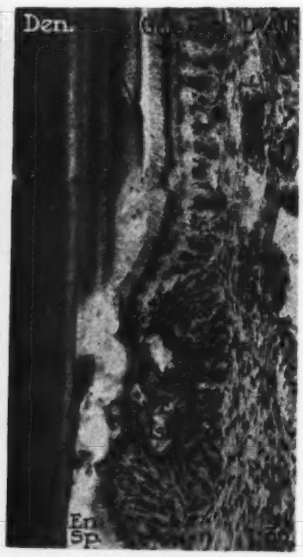
1. The first portion of the stratification is seen within less than forty-eight hours in the microscopic material, while it takes four weeks before it is recognized grossly in the exposed portion of the tooth.

2. The width of the component parts of the stratification is more than twenty times as great in the gross view as in the histologic sections because, in the latter view, the incremental layers are seen in extremely oblique sections.

3. The characteristic stratification is readily recognized in the gross view, not only because of the prominently increased width of the bands, but also because of the striking color contrast offered by the normal orange pigment and the abnormal white appearance (lack of pigment).

The earliest change recognizable in the gross picture consists of a reduction of the normal pigment in about two weeks after the beginning of the diet containing fluorine. This is explainable on the basis that the fluorine has a direct and disturbing effect on the enamel epithelium which is located in the middle portion of the tooth and which is active in the formation of pigment. The effect is not seen until that portion of the tooth has reached the oral cavity. The more severe effect on the enamel, traceable to disturbances in the formation of the organic matrix is recognizable in four weeks because this disturbance occurs in the posterior region, and it takes a longer period for this portion to arrive in the oral cavity.





Above, left: Fig. 7.—Midregion of midsagittal section of upper left incisor of rat referred to in Figure 5. (×250.)

Above, right: Fig. 8.—Midregion of midsagittal section of upper right incisor of rat referred to in Figure 7. (×250.)

Below: Fig. 9.—Transverse ground section of rat referred to in Figure 8. (×80.)

Comparison of Findings in Fluorosis with Those Reported in Other Experimental Conditions.—The dental tissues of the incisor of the rat are highly differentiated and selective and very sensitive. Their response to various experimental conditions will thus tend to some extent to follow a common pattern; but, in addition, the tissues show some characteristic features which are traceable to distinct experimental attacks. The features that are characteristic of fluorosis are not the same as those characteristic of other disturbances such as vitamin A deficiency (Wolbach and Howe[6]), rickets (Erdheim[7]), parathyroidectomy (Erdheim,[8] Toyofuku[9]), hyperparathyroidism (Schour, Tweedy and McJunkin[10]) and hypophysectomy (Schour and van Dyke[11]).

Probably the most outstanding histologic feature in the dental tissues in fluorosis is the selective action on enamel, particularly the primary accentuated incremental layers in the enamel. This effect is of special interest in the light of Erdheim's calcioprotective law.[7]

According to the latter, some tissues are more protected against disturbances in calcium metabolism than others. Thus, as a rule, enamel shows disturbances in calcification less frequently than does dentin.

The light or disturbed incremental layer seen in the dentin of our experimental animals reminds one of the transplantation stripe of Erdheim.[5] The occurrence in the dentin of a pair of light and dark incremental layers was found to be associated with single administrations of ergosterol or parathyroid hormone (Schour and Ham[12]) and hyperparathyroidism (Schour, Tweedy and McJunkin[10]). In the latter, the dark or secondary layer was found to be hypercalcified; while, in fluorosis, the dark layer indicates, as a rule, a recovery reaction to normally calcified dentin.

Comparison of Histologic Changes Reported in Human Mottled Teeth with Those Observed in the Teeth of Rats Treated with Fluorine.—Black and McKay[13] reported a disturbance in the interprismatic substance. Williams,[14] who used higher magnification and silver nitrate staining, reported a defective formation and calcification of both the interprismatic substance and the prisms. Our findings agree with those of Williams.

Black and McKay found no abnormal changes in the dentin. Williams did not

6. Wolbach, S. B., and Howe, P. R.: Incisor Teeth of Albino Rats and Guinea Pigs in Vitamin A Deficiency and Repair, Am. J. Pathol., 9:275 (May) 1933.

7. Erdheim, J.: Rachitis und Epithelkörperchen, Denkschriften der math. naturw. Klasse der Kais. Akad. der Wissensch., Vol. 90, 1914.

8. Erdheim, J.: Tetania parathyreopriva, Mitt. a. d. Grenzgeb. d. Med. u. Chir., 16:632, 1906.

9. Toyofuku, T.: Ueber die parathyreoprive Veränderung des Rattenzahnes, Frankfurt. Ztschr. f. Pathol., 7:249, 1911.

10. Schour, Isaac; Tweedy, W. R., and McJunkin, F. A.: Effect of Single and Multiple Doses of Parathyroid Hormone on Calcification of Dentin of Rat Incisor, Am. J. Pathol., 10:321-342 (May) 1934.

11. Schour, Isaac, and van Dyke, H. B.: Changes in Teeth Following Hypophysectomy. I. Changes in Incisor of White Rat, Am. J. Anat., 50:397 (July) 1932.

12. Schour, Isaac, and Ham, A. W.: Action of Vitamin D and of Parathyroid Hormone on Calcium Metabolism as Interpreted by Studying Effect of Single Doses on Calcification of Dentin, Arch. Pathol., 17:22-39 (Jan.) 1934.

13. Black, G. V., and McKay, F. S.: Mottled Teeth: Endemic Developmental Imperfection of Enamel of Teeth Heretofore Unknown in Literature of Dentistry, D. Cosmos, 58:129-156 (Feb.) 1916.

14. Williams, J. L.: Mottled Enamel and Other Studies of Normal and Pathological Conditions of This Tissue, J. D. Res., 5:117-195 (Sept.) 1923.

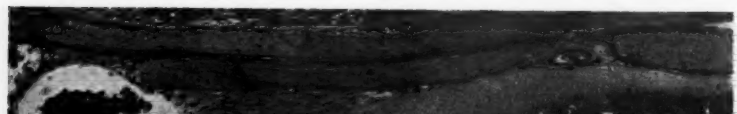


Fig. 10.—Section from posterior third of midsagittal section of upper incisor of Rat 9146. (×120.)

Fig. 11.—Transverse ground section of lower left incisor of rat referred to in Figure 10. (×27.)

discuss the dentin. The presence of normal dentin reported by Black and McKay is difficult to explain. It is possible that the sections were obtained from teeth that were not severely injured. It is questionable whether secondary calcification of the dentin could obliterate earlier imperfections in calcification. Thus, a comparison with the data available in the literature and based on limited human material indicates a similarity between human mottled teeth and the teeth of rats treated with fluorine. At our present state of knowledge, it is not possible to make a comprehensive comparison and to establish whether the changes are identical. The reported findings in human mottled teeth are based only on ground sections. The literature shows no record of a study of the changes in the enamel organ in human mottled teeth. The findings in ground and decalcified sections of unerupted teeth and their investing tissues obtained from children of endemic regions would constitute a logical basis for comparison with the findings in the continuously growing incisor of the rat.

Vitamin D and Fluorosis.—In our early histologic studies of both the experimental and the control material, we found an incidence of interglobular dentin, which was beyond the range of normal variation (Fig. 4). We were able to correct the imperfect calcification in the controls by the fortification of the basal diet with vitamin D. This treatment did not prevent the destructive action of fluorine on calcification in the experimental animals. This finding does not confirm that of Chaneles[15] (1930), who reported mitigation of the fluorine effects as a result of ultraviolet radiation.

Value of Fluorine Injections.—The establishment of fluorosis by injections is a valuable method. The timing of the administration is accurate and the effects are immediate. The histologic analysis is facilitated by data that are not available in diet experiments. The promptness of the effect and the ready recovery for each injection yield a response that is easily read. Valuable data may be obtained by experiments that are short in duration and that register in the same section the preexperimental, the experimental and the postexperimental pattern.

Our findings suggest the use of fluorine in the form of injections as a means of measuring the rate of apposition of enamel and dentin. Fluorine offers advantages over alizarin (Marshall)[16] and uroporphyrin (Pflüger),[17] because it is more easily obtained and more readily measured in both ground and decalcified sections. It is likely that the dosage of fluorine needed could be minimized so that there would be no untoward effects on the general health of the animal and on the normal rate of formation of the dental tissues.

A single injection of sodium fluoride can also be used to determine the time that it takes for a given incisor to renew its enamel. The time equals the interval between the administration of a single injection and the arrival of the nonpigmented incremental layer at the incisal edge.

Possible Basis for the Action of Fluorine.—The amount of fluorine which is sufficient to cause dental changes is very small compared with the amount of calcium in the blood. It is, therefore, not likely that the combination of fluorine

15. Chaneles, J.: Estudios sobre el fluor y la fluorosis experimental, Buenos Aires: Ferrari, 1930.

16. Marshall, J. S.: Study of Rate of Interstitial Growth of Persistent Teeth of Albino Rat as Shown by Vital Dyes, J. D. Res., 3:241 (June) 1921.

17. Pflüger, Hans: Untersuchung der experimentell erzeugten Porphyrie der Zähne im Lumineszenzmikroskop, Vierteljahrsschr. f. Zahnheilk., 47:203, No. 2, 1931.

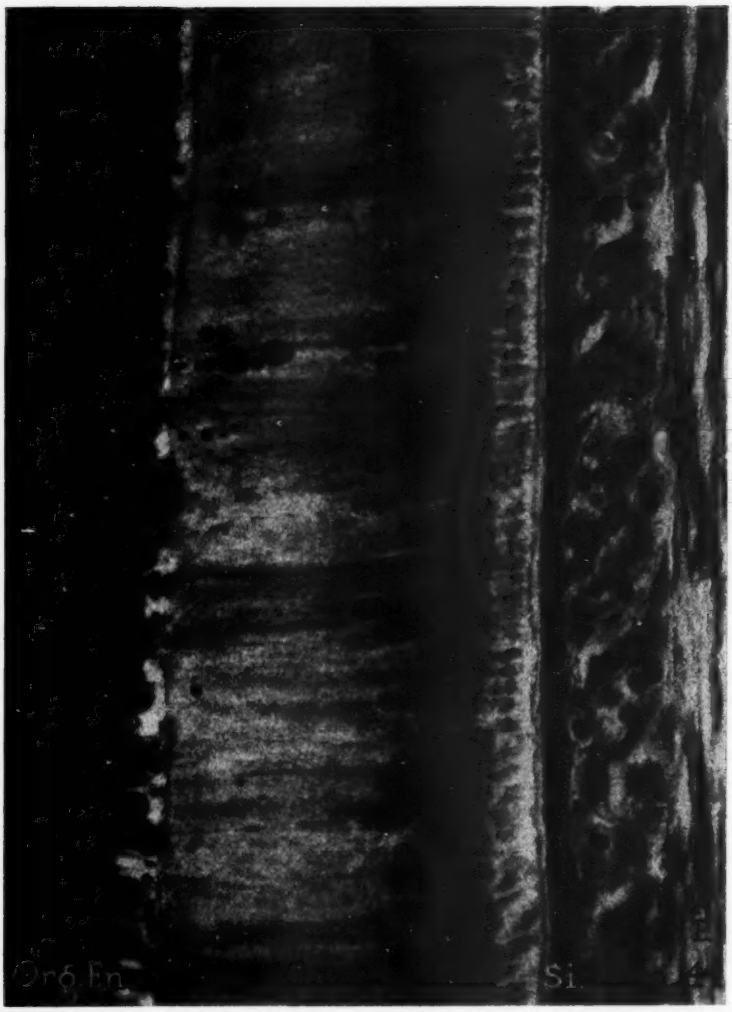


Fig. 12.—Posterior portion of enamel epithelium of upper right incisor of Rat 9874. (×696.)

with calcium within the blood stream would be in a sufficiency to disturb calcium metabolism appreciably.

Our histologic findings suggest that sodium fluoride has a prompt and direct influence on the formation and calcification of enamel and dentin and particularly on the enamel-forming cells.

The histologic response which could be recognized within from one to twenty-

four hours after a single injection of sodium fluoride was seen to be confined chiefly to the ganoblastic layer, which was still functional in forming enamel and located in the posterior portion of the tooth (Fig. 12). The fact that the gross changes in the pigment of the enamel can be recognized within two weeks after the first injection indicates that the fluorine also acts on the enamel organ situated in the anterior half of the incisor and on the processes concerned with the formation of pigment.

It is probable that when the sodium fluoride, which is highly soluble, enters the blood stream, the fluorine unites with calcium and forms calcium fluoride. The latter may be taken up by the cells concerned with the formation and calcification of enamel and dentin and injure them by acting in the nature of a foreign body. The enamel epithelium, in particular, which may normally possess a high selectivity for a relatively large amount of soluble calcium, is thus disturbed in its structure and function. The formation of the abnormal globules seen within the epithelium in Figure 12 may be due to the irritation of the cytoplasm resulting from the reception of the relatively insoluble calcium fluoride.

The presence in the calcified tissues of calcium fluoride at the expense of calcium carbonate and calcium phosphate may be another disturbing factor.

SUMMARY

In a study of the effect of acute fluorosis on the enamel and dentin of the incisor with respect to microscopic alterations in thirty-two white rats which had received injections of fluorine, and a study also of the incisors of sixteen litter mates used as controls, the histologic changes obtained by single or multiple injections were found to be as follows:

1. Both the enamel and the dentin show a pair of light (disturbed) and dark (recovery) incremental layers for each injection of sodium fluoride. The width of each pair is approximately 32 microns for injections given at forty-eight-hour intervals and approximately 16 microns for injections given at twenty-four-hour intervals.

2. The light layers represent the immediate response to the injections and are imperfect in formation and in calcification.

3. The dark layers represent a recovery response to the injections and are normal in formation and normal or excessive in calcification.

4. This incremental pattern is a constant finding except in single injection experiments in twenty-four hours or less of postoperative life. Disturbances of this pattern arise when the dosage is increased or when the administration is continued for more than five injections at twenty-four-hour intervals.

5. The earliest changes in acute fluorosis are observed in animals that were given a single injection of 0.3 c.c. of 2.5 per cent sodium fluoride and allowed to live only one hour after the administration. These changes are recognized in the posterior region of the incisor within the ganoblastic layer in the form of an abnormal character and distribution of globules. In addition, the incremental surface of the organic enamel matrix lacks its normal arrangement and is covered with hemispherical globules that stain deeply with hematoxylin in the animals that were allowed to live from twelve to twenty-four hours after the administration.

The injection of fluorine offers an accurate and easy method of measuring the rate of growth of the enamel and dentin in continuously growing teeth.

It is believed that fluorine exerts a direct local action on the enamel-forming

cells and that the changes observed in the enamel and dentin are not produced primarily by changes in blood calcium and phosphorus or by disturbances in the parathyroids.

The material presented in this paper throws interesting light on various phases of the growth processes of the enamel and dentin. It offers valuable evidence that both the enamel and the dentin of the incisor of the rat grow at the rate of approximately 16 microns in twenty-four hours.

Figure 1 shows the ringed appearance of the incisors of rats on low levels of fluorine. Figure 2 shows the different effects that can be produced by varying the amount of sodium fluoride injected and the interval between injections. The incisors of a rat given four injections of 0.6 c.c. of a 2.5 per cent solution of sodium fluoride at ninety-six-hour intervals are shown.

Figure 3 is a photomicrograph of the posterior portion of a midsagittal section of the upper right incisor of Rat 8392, which was given eight injections of 0.3 c.c. of 2.5 per cent sodium fluoride at forty-eight-hour intervals and was killed forty-eight hours after the last injection. *Incr.* indicates the increment layers in the organic enamel matrix *(Org. En.)*; *Den.*, dentin; *Gan.*, ganoblasts; *Od.*, odontoblasts; *Pap.*, epithelial papillae; *Pre.*, predentin; *L.A.P.*, labial alveolar periosteum.

Figure 4 is a photomicrograph of the labial dentin of the anterior portion of a midsagittal section of the upper right incisor of the rat referred to in Figure 3. The dentin D_1 was formed and calcified before the experiment began. The dentin D_2 was formed and calcified during the experimental period. *Od.* indicates odontoblasts. D_2 shows a regular and successive stratification consisting of eight pairs of light and dark incremental layers *(1-8)*. These correspond with the eight injections of sodium fluoride that were administered at forty-eight-hour intervals. The width of each pair is approximately 32 microns.

Figure 5 is a photomicrograph of a field from a midsagittal section of the upper right incisor of Rat 8410, which was given four injections of 0.3 c.c. of 2.5 per cent sodium fluoride at forty-eight-hour intervals and was killed fourteen days later. This field is taken from the gingival portion of the tooth. *Ging.* indicates the gingival crest; *En. Sp.*, enamel space; D_1, dentin formed before the experiment; D_2, dentin formed during the experiment; D_3, dentin formed after the experiment; *Od.*, odontoblasts. D_2 shows a regular stratification consisting of four pairs of light and dark layers. These pairs correspond in position with the time of the four injections and in width with the duration of the intervals between the injections. The width of each pair is approximately 32 microns. The lamellation in D_3 is more prominent than in D_1.

Figure 6 is a photomicrograph of a transverse ground section of a lower incisor of the rat referred to in Figure 5. To the left, the enamel covers the normal dentin *(D_1)*, which was formed before the experiment began. The area of marked stratification in the dentin, D_2, was formed during the experiment and consists of four pairs of light and dark layers, each 32 microns in width. In the dentin formed after the injection *(D_3)*, there is also stratification, the latter consisting of fourteen pairs of light and dark stripes, which correspond with the number of days that elapsed between the last injection and the death of the animal and which are each approximately 16 microns in width.

Figure 7 is a photomicrograph of a midsagittal section of the upper left incisor of the rat referred to in Figure 5.

The organic enamel matrix *(Org. En.)*, which persists, shows light incremental layers *(Incr.)*. There is an absence of ganoblasts and invasion of the labial alveolar periosteum *(L.A.P.)* by the enamel epithelium, which has become stratified squamous epithelium.

Figure 8 is a photomicrograph of the midregion of a midsagittal section of the upper right incisor of the rat referred to in Figure 7. The organic enamel *(Org. En.)* persists. There is stratification of the enamel. The width of the enamel is less than normal in the field where the ganoblasts *(Gan.)* are short and the enamel epithelium is disturbed. The islands of enamel are lost in decalcification *(E. Isl)*. *Pap.* indicates the epithelial papillae; *L.A.P.*, labial alveolar periosteum; *En. Sp.*, enamel space; *Den.*, dentin.

Figure 9 is a photomicrograph of a transverse ground section of the rat referred to in Figure 8. This section was obtained from a level farther back than in Figure 6. There is stratification of the enamel and the dentin next to the enamel *(Exp.)*. The similarity in width of the incremental enamel *(1-4)* and dentin *(1-4)* layers was induced by the experiment.

Figure 10 is a photomicrograph of a section from the posterior third of a midsagittal section of an upper incisor of Rat 9146, which was given five injections of 0.3 c.c. of 2.5 per cent sodium fluoride at forty-eight-hour intervals and was killed forty-eight hours after the final injection. The irregular surface of the organic enamel may be noted, at *Org. En.;* isles, at *En. Isl.*, and the peninsular projections of enamel. There is disturbance of the enamel epithelium near the enamel isles. *Al. B.* indicates the alveolar bone; *Gan.*, ganoblasts; *L.A.P.*, labial alveolar periosteum; *Od.*, odontoblasts; *Pap.*, papillae; *Pre.*, predentin; *Incr.*, light incremental layers.

Figure 11 is a photomicrograph of a transverse ground section of the lower left incisor of the rat referred to in Figure 10. The dentin D_1, formed before the experiment, shows no prominent lamellation. The five pairs of light and dark layers in the dentin D_2 were laid down and calcified during the experiment. P.D.M. indicates the periodontal membrane; *Al. B.*, alveolar bone.

Figure 12 is a photomicrograph of the posterior portion of the enamel epithelium of the upper right incisor of Rat 9874, which was given one injection of 0.3 c.c. of 2.5 per cent sodium fluoride and was killed twenty-four hours later. There are globules within the ganoblasts *(Gan.)* near the irregular surface of the organic enamel matrix *(Org. En.) Si.* indicates the stratum intermedium; *Oep.*, outer enamel epithelium; *L.A.P.*, the labial alveolar periosteum.

THE OCCURRENCE OF MOTTLED ENAMEL ON THE TEMPORARY TEETH*

By MARGARET CAMMACK SMITH and H. V. SMITH, Tucson, Ariz.

MOTTLING of the enamel, which we now know to be caused by the poisonous action of fluorine which is present in the water supply used by the affected persons in the concentration of 1 part per million or above, has been considered primarily a defect of the second or permanent set of teeth. In 1916, McKay said, "Mottled enamel in my experience has never been found upon the temporary teeth." He remarked further that "in examining children in affected districts at ages when the permanent incisors and first molars have erupted but the temporary molars are still in place, the contrast in the enamel on the two varieties of teeth is most pronounced." In 1932, McKay stated that "the temporary teeth have been found to be affected very rarely and then only the molars and *very slightly*."

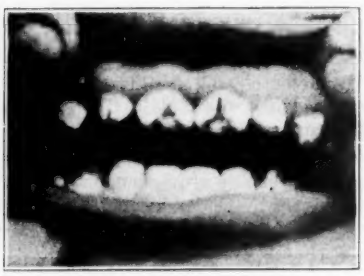


Fig. 1.—Mottled deciduous teeth of 5-year-old girl. The teeth are stained and corroded.

We have personally examined the teeth of thousands of children in Arizona to determine the incidence of mottled enamel. In 1931, we reported that "deciduous teeth only rarely show mottling, mottling being chiefly a defect of the permanent teeth, although a few cases in the temporary molars of Indian children in Arizona have been observed."

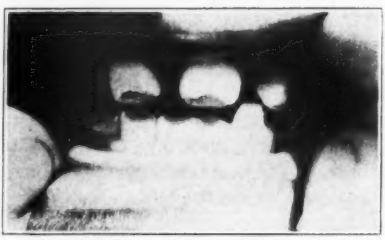


Fig. 2.—Teeth of 7-year-old girl. Except for the incisors, the teeth are deciduous. All are corroded. The molars are almost devoid of enamel and are ground off almost to the gum line.

Thousands of cases show that although mothers drink water containing sufficient fluorine to cause mottling of the enamel, the occurrence of mottled enamel on the temporary teeth of their children is rare indeed. When their children are allowed to drink water from the same source, their normal deciduous teeth are replaced by a permanent set of teeth which are mottled when they erupt.

In explanation of this almost complete freedom of deciduous teeth from mottled

*From the University of Arizona.

enamel, McKay said, "It must be remembered that the temporary teeth are formed largely before birth in an environment sheltered against outside influences with a nutritive supply dialysed through placental osmosis." There is clinical evidence that even though the pregnant woman drinks water containing as much as 6 parts per million of fluorine, an amount of this fluorine sufficient to interfere with the formation and calcification of the deciduous teeth during fetal life does not pass through the maternal placenta. Our experimental findings on rats bear out this indication of lack of transfer of fluorine from mother to offspring. We have found

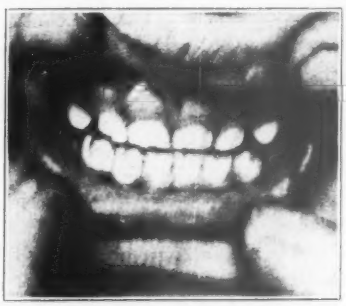


Fig. 3.—Deciduous teeth of 2½-year-old boy. The enamel of all the teeth is chipped off at the edges.

that the teeth of young rats whose mothers received an amount of fluorine in their food supply (0.05 per cent sodium for the ration) sufficient to severely mottle their own teeth are normal at 3 weeks of age, when the young are usually weaned. If the young are continued on the fluorine-containing food supply of the mother, the new incisor growth which appears about two weeks thereafter has lost its luster and becomes corroded, as is typical of severely mottled enamel.

It would appear also from both clinical and experimental evidence that fluorine, even though present in the food or water supply of the nursing mother in a concentration sufficient to cause mottling of the enamel, is not secreted in toxic concentration in her milk supply. Drea has determined by chemical analysis the fluorine content of the ash of milk from cows drinking water containing 2 parts per million of fluorine and found relatively little fluorine present. Phillips *et al.* have recently shown that the fluorine content of cow's milk is comparatively difficult to influence by dietary means. Feeding to lactating cows large amounts of a mineral supplement which contained sufficient fluorine to produce a toxic effect on the cows themselves did

Fig. 4.—Deciduous teeth of 4½-year-old girl, sister to the boy whose teeth are shown in Figure 3. The front teeth are not mottled, but the molars were chalky white and corroded.

not appreciably increase the fluorine content of their milk supply as tested by both chemical and biologic methods. From this evidence, it seemed likely, therefore, that milk from cows raised in regions where mottling of enamel is endemic could be considered safe from the fluorine standpoint; that nursing mothers might drink fluorine-containing water without secreting any appreciable amount in their milk and thus endangering the temporary teeth of the nursing infant, and that the occasional finding of mottled

enamel on the deciduous molars, which are the last of the temporary set to calcify and erupt, was due to the action of fluorine in the drinking water of the child after birth. The evidence presented in this paper makes these conclusions somewhat untenable.

It is the purpose of this paper to report the occurrence of severely mottled enamel on all of the deciduous teeth of children in a community recently visited by us. Figure 1 shows the teeth of a 5-year-old girl. All of her temporary teeth were in place and all of them were mottled. The upper incisors showed stain and the enamel on the rest of the teeth was severely corroded. In Figure 2 may be seen the teeth of her sister, 7 years of age at the time the photograph was taken. Except for the incisors and the first permanent molars, all of the teeth were deciduous. Both upper and lower incisors were a dull chalky white and the enamel had chipped off a considerable portion of the lower edge of these teeth. The remaining temporary teeth were almost devoid of enamel and the deciduous molars were ground off almost down to the gum line.

The parents of these two children were financially able to seek dental advice and had repeatedly done so, but the dentists were completely baffled as to the cause of the condition. The characteristic chalky whiteness typical of mottled enamel was absent in the case of the temporary teeth because most of the enamel was gone. The severity of the condition and the fact that the teeth were deciduous was not suggestive of mottled enamel. A Wassermann test showed the absence of venereal infection. Analysis of the water supply from the well on their citrus fruit ranch revealed a fluorine content of 12.0 parts per million. The determination was made by the Foster method of analysis, by means of which 1 part per million of fluorine has been shown to be the toxic level.

Subsequently, many cases of severe mottling of the deciduous teeth were found in this section, and analyses of local water supplies have shown extremely high concentrations of fluorine.

Figure 3 shows the temporary teeth of a 2½-year-old boy. It may be seen that the enamel on all of the teeth, both upper and lower, was chipped on the edges and the remaining enamel was a dull, chalky white. The 4½-year-old sister whose teeth are pictured in Figure 4 moved into the community at the age of 12 months, at which time she had eight temporary teeth, which were normal. Her molars, which cannot be seen in the photograph, were severely corroded and typically mottled. The water supply was found to contain 13.5 parts per million of fluorine.

All of these children were artificially fed from birth on and the mother did not drink the water high in fluorine during pregnancy. The private well-water supply had been used in the making of the milk formula.

Such cases as these, which show such a strong influence of the water on the temporary teeth, suggests that a very considerable part of the calcification of the enamel of the deciduous teeth does go on after birth. The rapidity of calcification of the temporary teeth as compared with that of the permanent set may explain why *only* the use of water containing extremely high concentrations of fluorine will produce mottling of the enamel of the deciduous teeth. Experimentally we have found that rats' teeth are less susceptible to fluorine than are the teeth of human beings in that it takes a much higher concentration of fluorine to produce mottling of the enamel in the rat. Their incisor teeth grow at a much

more rapid rate; for a period of thirty days only is necessary for complete formation and calcification of the lower incisors. It may be that the shorter the period of development of teeth, the greater the amount of fluorine necessary to interfere with their calcification and thus produce mottling of the enamel. Suffice it to say that mottling of the enamel of the deciduous teeth of the severest type has been observed in children whose water supply contains a high concentration of fluorine. The water supply of children in this district contained from 12 to 18 parts per million of fluorine, the highest concentration heretofore reported for any community.

It is interesting to note also that mottled enamel of the permanent teeth has been observed in the children of certain families who have not used this water at all for drinking purposes, but have used it for cooking and other household purposes.

(Severe mottling of the enamel of the temporary teeth has since been found in breast-fed infants. This points to the passage of fluorine into the fetal system or into the milk supply of the nursing mother. Again, the fluorine concentration of the water supply was found to be excessively high.)

FURTHER STUDIES IN MOTTLED ENAMEL*

By MARGARET CAMMACK SMITH, Ph.D.; EDITH M. LANTZ, M.A., and H. V. SMITH, M.S., Tucson, Ariz.

THAT mottling of the enamel of human teeth is caused by the destructive action of fluorides in the water supply is now an accepted fact. In 1931, in the Nutrition Laboratory of the University of Arizona,[1] a defect similar to human mottling of enamel was produced experimentally in albino rats. This was accomplished both by the incorporation in their diet of the residue from the water supply of a community in which mottled enamel occurred, and also by the incorporation of small amounts of sodium fluoride in the food of the experimental animals. Subsequent analyses of the water supply from several regions in which mottling of enamel was endemic revealed the presence of fluorides in high concentration as compared with the amounts found in water supplies of other areas in which mottling of enamel did not occur. It is the purpose of this paper to touch briefly on some of the studies carried on at the University of Arizona which have thrown further light on this problem.

A survey of existing conditions in Arizona disclosed forty-five towns or rural districts in which all of the native born children had mottled enamel. Figure 1 shows the map of the state of Arizona, upon which the endemic communities are indicated by the solid black circle. It may be noted that most of the endemic communities lie along the Gila and San Pedro rivers.

*From the Department of Nutrition, University of Arizona.

1. Smith, Margaret C.; Lantz, E. Maud, and Smith, H. V.: Cause of Mottled Enamel, Defect of human Teeth, Univ. of Ariz. Agr. Exp. Sta. Tech. Bull. No. 32, 1931.

These communities were found to be drinking water with a fluoride content ranging in concentration from 1 to 6 parts per million, as tested by the Foster method of analysis. On the other hand, the fluoride content of the water supply of nonendemic communities was below 1 part per million.[2]

The severity of the mottling found varied in different communities with the concentration of fluorine in the water supply. The lower part of Figure 2 shows the type of mottling associated with 2 parts per million or above. The teeth are very defective, the enamel being badly corroded and chipped and badly stained. In the middle section of Figure 2, the defect is less severe. Although the teeth are badly stained, they are fairly strong and the enamel is not pitted. The upper part of Figure 2 shows a mild type of mottling of the enamel in which the teeth are not stained and the enamel is not pitted, but dull white areas are distributed irregularly over their surface.

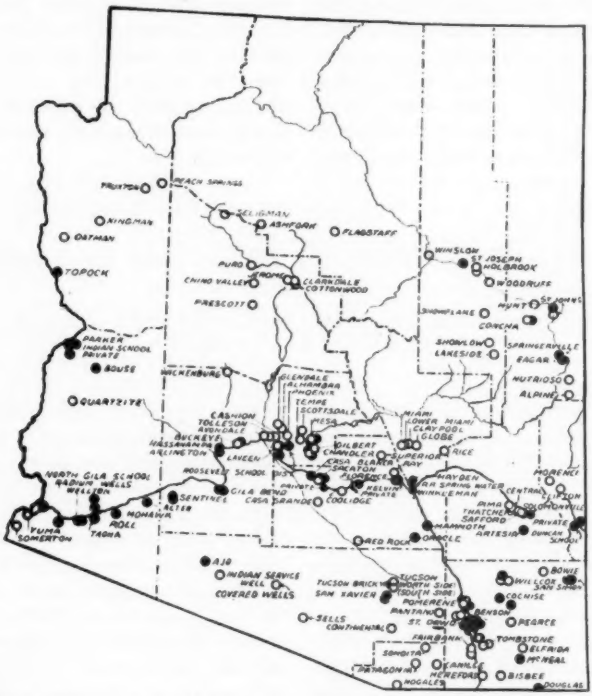


Fig. 1.—Distribution of mottled enamel in Arizona. Each circle or part circle indicates one water supply tested. Black dots indicate communities in which mottled enamel was found. Circles indicate communities in which mottled enamel was not found or reported to occur. Half-circles indicate communities in which mottled enamel was found in rural districts, but did not occur among users of the central water supply.

2. Smith, H. V.: Determination of Fluorine in Drinking Water, Ind. & Eng. Chem., 7:23 (Jan.) 1935.

This type is usually associated with the lower concentration of fluorine; namely, 1 part per million as determined by the Foster method of analysis.

In any given community, although the severity of mottling of the enamel varied among individuals, there was no exception to the rule that uninterrupted use of water which contained excessive amounts of fluorine produced mottling of the enamel. Apparent exceptions have always been found to be in people who were not native to the community or were intermittent users of the fluoride-containing water.

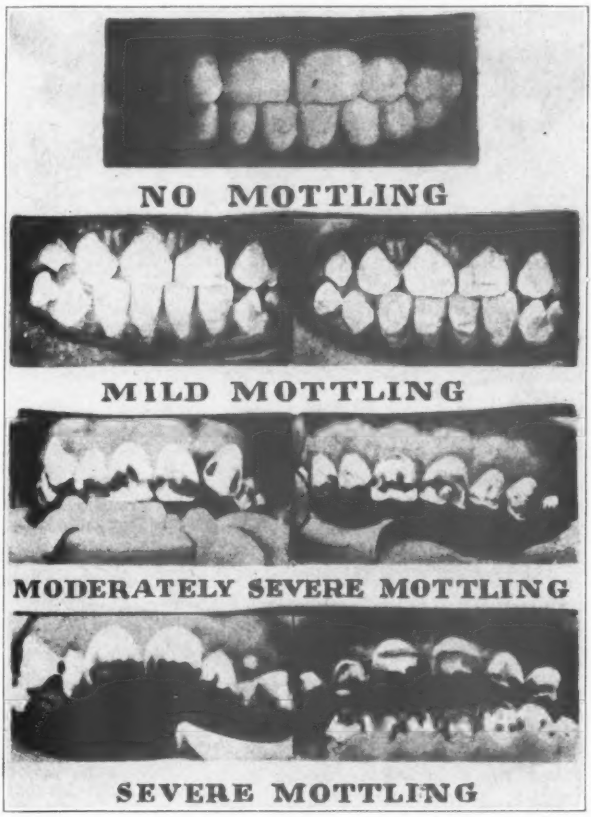


Fig. 2.—Typical cases of mottled enamel among Arizona school children.

Differences in the fluoride content of the waters tested could not be correlated with differences in depth of the water supply or in type of well. The belief that artesian or deep-well water is more likely

3. Leverton, Ruth M., and Smith, Margaret C.: Relation of Calcium and Phosphorus in Diet to Cause of Mottled Enamel of Human Teeth, J. Home Economics, 24:1091, 1932.

to contain high concentrations of fluorides was not borne out in Arizona. The cities of Mesa and Tempe have solved their problem of finding a water supply low in fluorine by tapping a source much deeper than their first source. On the other hand, the city of Douglas, hoping to improve a highly mineralized, poor tasting water, dug deeper and, as a result of the change, is now pumping into the

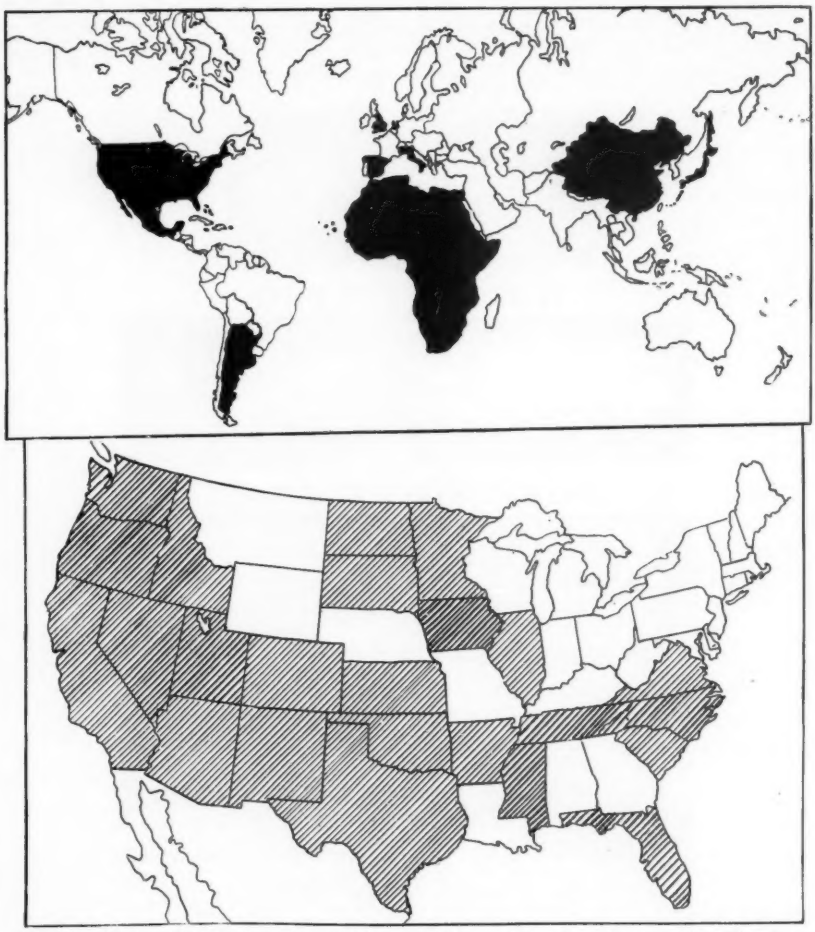


Fig. 3.—Above: Distribution of mottled enamel in countries throughout world. The darkened areas indicate countries in which the occurrence of mottled enamel has been reported in at least one section. Below: Distribution of mottled enamel in the United States. The shaded areas indicate states in which the occurrence of mottled enamel has been reported in at least one section.

TABLE 1.—COMPARISON OF THE CALCIUM AND PHOSPHORUS CONTENTS OF THE DIETS OF TWO GROUPS OF CHILDREN

	Children with Mottled Enamel	Children with Normal Teeth	Sherman's Standard for Children 3-14 Years
Average daily calcium intake (gm.)	1.17	1.18	1.70
Average daily phosphorus intake (gm.)	1.20	0.91	1.16
Ratio of calcium to phosphorus in intake	1:1	1.3:1	1:1

TABLE 2.—COMPARISON OF CALCIUM AND PHOSPHORUS RETENTION OF GROWING RATS ON RATIONS WITH AND WITHOUT SODIUM FLUORIDE

Amount of Sodium Fluoride in Ration	Retention of Food Calcium Per Cent	Retention of Food Phosphorus Per Cent	Daily Retention of Calcium per Kilogram of Body Weight (Gm.)	Daily Retention of Phosphorus per Kilogram of Body Weight (Gm.)
		Period 1		
None	75.4	45.7	0.239	0.229
0.05	72.7	45.3	0.227	0.224
0.1	38.3	32.3	0.112	0.149
		Period 2		
None	75.2	41.4	0.236	0.205
0.05	74.9	38.1	0.161	0.126
0.1	40.9	38.0	0.129	0.190

TABLE 3.—COMPARISON OF THE CALCIUM AND PHOSPHORUS RETENTION OF DOGS FED FLUORINE AND OF THOSE NOT FED FLUORINE

Subject	Retention of Food Calcium Per Cent	Retention of Food Phosphorus Per Cent	Daily Retention of Calcium per Kilogram of Body Weight (Gm.)	Daily Retention of Phosphorus per Kilogram of Body Weight (Gm.)
		Period 1		
Fluorine fed	23.9	0.71	0.033	0.0008
Control	26.4	13.0	0.053	0.0155
		Period 2		
Fluorine fed	22.4	7.8	0.039	0.0117
Control	30.6	14.7	0.054	0.0219
		Period 3		
Fluorine fed	45.7	15.0	0.076	0.0211
Control	23.1	20.0	0.038	0.0287

city water mains water which is lower in total salt content, but contains more than 2.5 parts per million of fluorine.

It is interesting to speculate as to the source of fluorine in the water. Fluorine compounds are widely distributed in the earth's crust, ranking twentieth in quantity. Minerals occurring in rocks and soils which may carry fluorine are biotite, cryolite, fluorspar, fluorapatite, rock phosphate, tourmaline, selenite and phlay-

Fig. 4.—Chalky white and corroded condition of incisors of rat which received fluorine in its ration. The addition of a liberal supply of cod liver oil or viosterol did not prevent the destructive action of the fluorine.

ophite. It is not surprising, therefore, that mottled enamel has been reported from twenty-three states in the United States and all continents of the world except Australia. (Fig. 3.) In Arizona, there are ten commercial deposits of fluorspar (calcium fluoride) and half of these lie on or near the Gila and San Pedro rivers, along which most of the endemic areas lie.

Although variations in severity of mottling of enamel among users of the same water supply may be due in part to difference in nutritive condition, our studies of the dietary habits of certain children with mottled enamel has excluded poor food habits as a cause of mottling of enamel. A quantitative study of the diets of sixteen children with mottled enamel was made and compared with a similar study of the diets of children who were free from this dental defect. Individual composite samples were made of the food intakes of the children studied and these composites were analyzed for calcium, phosphorus, nitrogen and calories. All of the diets were found to be adequate in protein and energy content. The data relative to the tooth-forming elements, calcium and phosphorus, are given in tabular form in Table 1.

The daily calcium content of the diets of the children with mottled enamel averaged 1.15 gm., and of those without mottled enamel, 1.18 gm. Both of these figures compare very favorably with Sherman's standard of 1 gm. of calcium daily for optimum nutrition. Again, the daily phosphorus intakes and the ratio of calcium to phosphorus in the diets showed no significant differences between the groups and both compare favorably with Sherman's optimum standard. The diets of the children who had mottled enamel could not therefore be considered inadequate or inferior in either calcium or phosphorus content.

In addition to this dietary study, thirty children living in an endemic community have been given a vitamin D supplement daily in the form of cod liver oil or 250 D viosterol during the school year for three years between the ages of 6 and 9. During this time, the first group of permanent teeth, namely, the first molars

and the central and lateral incisors, have erupted and all of them were mottled on eruption. It has also been noted that the feeding of cod liver oil or viosterol to rats on rations containing 0.025 per cent of sodium fluoride did not prevent the destructive action of fluorine upon the developing teeth. (Fig. 4.)

Thus, the findings indicate that adequate intakes of the tooth-forming elements, calcium or phosphorus, or of vitamin D, which regulates the deposition of calcium and phosphorus in the teeth during the years of enamel formation, will not prevent the poorly calcified tooth defect known as mottling of enamel, if fluorine in toxic amounts is present in either the food or the water supply.

As further proof that fluorine is toxic to animals other than the rat, the same type of damage was produced in the teeth of guinea-pigs and in the permanent teeth of dogs,[4] which have two sets of teeth. Figure 5 shows the result of the incorporation of 0.025 per cent of sodium fluoride in the ration of dogs. The enamel of the permanent teeth of the fluorine-fed animal is corroded and badly chipped. With dogs, also, the supplemental feeding of vitamin D as viosterol or cod liver oil was without preventive effect.

Dental abnormalities of the same type as those obtained by the feeding of fluorides have also been produced by the subcutaneous or intramuscular injection of a solution of sodium fluoride. A mottled enamel effect which is perhaps more typical in appearance of human mottled enamel was produced by the intermittent injection of fluorides. By this means, in rat incisors, both normal and abnormal white and pitted areas have been obtained. By varying the length of interval between injections and the concentration of the fluoride solution injected, enamel effects differing in outward appearance have resulted. Figure 6 shows the incisors of an adult rat into which eight injections of a 2.5 per cent solution of

Fig. 5.—Mottled enamel on permanent teeth of dog that received fluorine in its ration. There is extreme corrosion of the enamel.

4. Smith, Margaret C., and Lantz, Edith M.: Experimental Production of Mottled Enamel, Univ. of Ariz. Agr. Exp. Sta. Tech. Bull. No. 45, 1933.

sodium fluoride were made on alternate days. Eight rings of abnormal dull-white and corroded areas alternating with eight normal, translucent and pigmented areas may be noted. As is the case with human teeth, normally formed enamel did not become mottled on fluorine intake, for there was no outward change in the enamel of the already erupted portion of the incisors. The first ring appeared twenty-seven days after the first injection. Evidently, the most sensitive part of the enamel organ in the basal portion of the tooth was affected, for the rat incisor renews itself in about thirty days. Results of variations in the length of the interval between injections and in the strength of the sodium fluoride solution are shown in Figure 6.

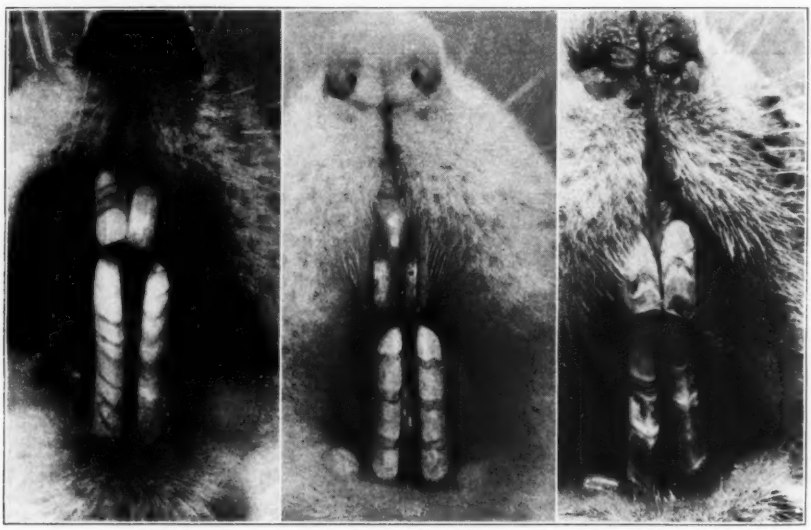


Fig. 6.—Results of intermittent injections of fluorine. Normal bands alternate with abnormal bands. Left: Results of eight injections at forty-eight hour intervals. Center: Results of four injections of strong solution of sodium fluoride every fourth day. Right: Results of injections at irregular intervals.

It is quite evident that the fluorine does not exert its toxic action in the mouth, but is carried in the blood stream to the tooth and interferes with its formation before it has erupted in the oral cavity. Histologic examinations now being carried on by Isaac Schour will no doubt throw considerable light on the place of attack of fluorine.

We have attempted to gain some information relative to the mode of action of fluorine by determining its effect on tooth composition and on the metabolism of calcium and phosphorus. Chemical analyses[5] of the incisors of animals receiving 0.1 per cent sodium fluoride in their ration indicate that fluorine interferes with the calcification of the tooth. The teeth of the fluorine-fed animals are

5. Smith, Margaret C., and Lantz, Edith M.: Effect of Feeding of Fluorides upon Chemical Composition of Teeth and Bones of Albino Rats, J. Biol. Chem., 101:677 (Aug.) 1933.

smaller, weigh less and contain a lower percentage of ash or mineral material. A greater amount of calcium in proportion to the phosphorus suggests that calcium is laid down in combination with fluorine as perhaps calcium fluoride. The change in the chemical composition of mottled teeth may well resemble the change going on in bone during fossilization in nature. Carnot has shown that fossil bones contain fluorine, which they obtain from contact with fluorine-bearing waters, and that the fluorine content of fossil bone increases with age. The deposition of excessive amounts of calcium as the fluoride in mottled teeth may explain their altered physical characteristics and their tendency to corrode, chip and crumble. Similar differences in the chemical composition of the bones of the fluorine-fed animals were also noted.

TABLE 4.—COMPARISON OF CALCIUM AND PHOSPHORUS METABOLISM OF GIRLS WITH AND WITHOUT MOTTLED ENAMEL

Subject	Age	Daily Retention per Kilogram of Body Weight		Excretion in Urine Per Cent	
		Calcium Mg.	Phosphorus Mg.	Calcium	Phosphorus
Mottled enamel	10	5.1	1.7	15.7	62.5
Control	10	3.7	1.0	5.5	55.1
Mottled enamel	13	1.4	3.5	12.6	73.3
Control	13	1.4	5.9	5.7	70.2

TABLE 5.—EFFECT OF DIFFERENT COMPOUNDS OF FLUORINE UPON TEETH, MORTALITY AND GROWTH RATE OF RATS*

Fluorine in Ration Per Cent	Source of Fluorine							
	Sodium Fluoride		Cryolite		Calcium Fluoride		Barium Fluosilicate	
	GAIN	TEETH	GAIN	TEETH	GAIN	TEETH	GAIN	TEETH
0.000353	166		173		167		158	
0.000706	158		160		162		153	
0.001410	168	Mottled	154	Mottled	158	Mottled	159	Mottled
0.005650	156	Mottled	162	Mottled	163	Mottled	163	Mottled
0.011300	156	Mottled	153	Mottled	157	Mottled	160	Mottled
0.022600	133	Mottled	159	Mottled	164		135	Mottled
0.045200	63	Mottled	160	Mottled	159	Mottled	70	Mottled
0.090400	Kills		158		155		Kills	
0.226000			130		160	Mottled		
0.452000			95		132			
0.904000			88		116			
1.356000			66		95			
2.712000			Kills					
3.600000					Kills			

*Six weeks gain in weight.

Interference with normal calcification of both teeth and bones is indicative of a general disturbance in the metabolism of calcium and phosphorus in the body of the animal receiving fluorine. An investigation of the effect of fluorine feeding on the metabolism of calcium and

phosphorus has been carried on for the past two years. Calcium and phosphorus balance experiments were conducted with children who drank water containing fluorine and with rats and dogs fed sodium fluoride in their ration. In each case, a diet constant in composition and amount has been fed over several experimental periods and analyses of the calcium and phosphorus content of the food intake and of the excretion products (feces and urine) have been made. The balance of calcium and phosphorus in representative cases under these controlled conditions of feeding are presented for rats in Table 2, for dogs in Table 3 and for children in Table 4.

When young rats are fed fluorine, their ability to metabolize calcium and phosphorus is decidedly impaired.[6] Table 2 shows that the fluorine-fed rats retained a lower percentage of the calcium in their food and a less number of grams of calcium per kilogram of body weight. When as much as 0.1 per cent of the ration is sodium fluoride, the rats retain almost 50 per cent less calcium and less than 50 per cent as much phosphorus as their control litter mates that are not fed fluorine. (Fig. 7.)

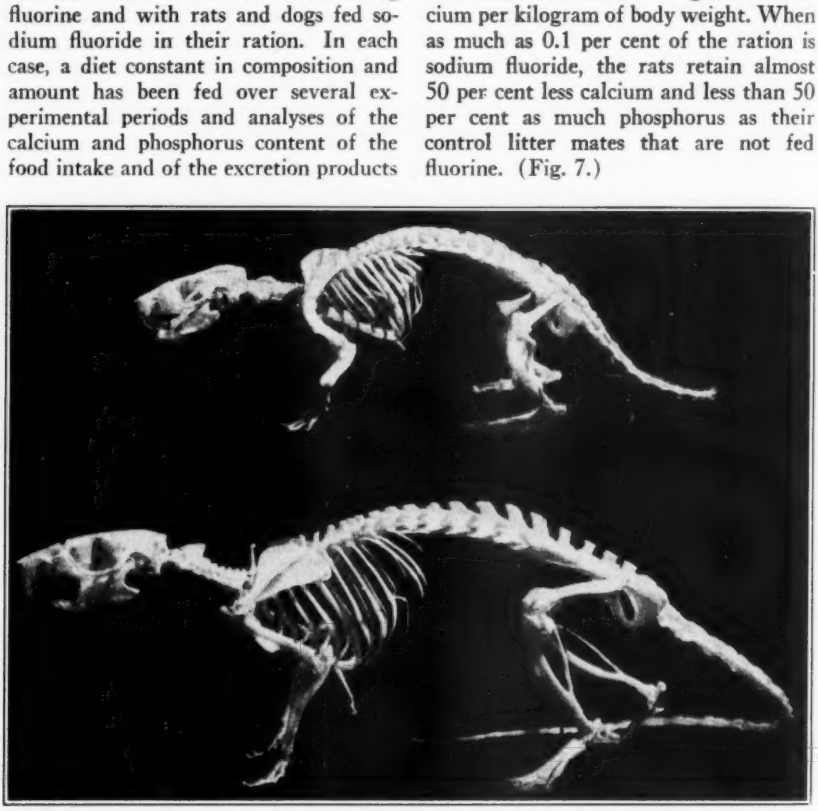


Fig. 7.—Litter mates. The upper animal received 0.1 per cent sodium fluoride in its ration, stunting and deformity of bone development resulting.

Fluorine was also found to interfere with body growth and to retard the rate of eruption of the incisor teeth. A similarity in the degrees of effects produced

6. Lantz, Edith M., and Smith, Margaret C.: Effect of Fluorine on Calcium and Phosphorus Metabolism in Albino Rats, Am. J. Physiol., 109:645, 1934.

suggests a relation between tooth eruption, body growth and bone development. (Fig. 8.)[7]

The data presented in Table 3 are for adult dogs, which received 100 mg. of sodium fluoride in capsules daily. They show also a lowered retention of both calcium and phosphorus in the fluorine-fed dogs, although the differences are less striking than in the case of the rats, probably because the amount of fluorine given was less. In each case, with both rats and dogs, a greater interference with the retention of phosphorus than with that of calcium was observed.

Calcium and phosphorus balance experiments were also carried on with girls who had mottled teeth because they had always lived in a community in which the drinking water supply contained approximately 4 parts per million of fluorine. These girls were controlled by girls of the same age who had lived in a neighboring community free from this type of tooth defect.[8] Data obtained for four of the girls studied appear in Table 4.

No significant or consistent differences in retention of either calcium or phosphorus were observed, in spite of the fact that two of the girls were drinking water containing sufficient fluorine to have caused rather severe mottling of the teeth. A difference in the path of excretion of calcium and phosphorus was noted between the two pairs of girls, the girls who had mottled teeth showing in the urine a larger percentage of both the calcium and the phosphorus excreted.

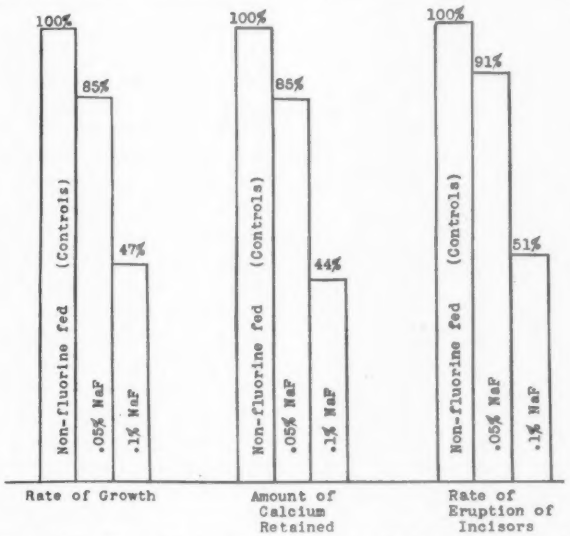


Fig. 8.—Comparative effect of ingestion of fluorine on body growth, bone development, as indicated by retention of calcium and phosphorus, and rate of eruption of the incisors.

7. Smith, Margaret C.: Effect of Fluorine upon Rate of Eruption of Rat Incisors and Its Correlation with Bone Development and Body Growth, J. D. Res., 14:139 (April) 1934.

8. Lantz, Edith M.; Smith, Margaret C., and Leverton, Ruth M.: Calcium and Phosphorus Metabolism of Children with Mottled Enamel, to be published.

It may be that this difference in path is indicative of some difference in the metabolism of both calcium and phosphorus due to the ingestion of fluorine. The situation with the human subjects is not comparable to that of either rats or dogs, for their fluorine intake was infinitesimally small in comparison. It seems that a daily intake of fluorine sufficient to mottle the teeth of human subjects causes no great disturbance in their ability to metabolize calcium and phosphorus.

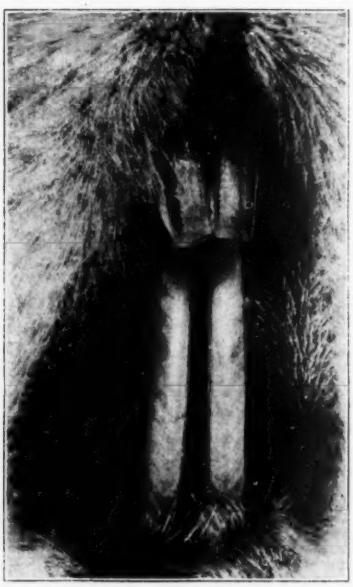


Fig. 9.—Initial effect of ingestion of fluorine on incisors of rats. All compounds of fluorine investigated produced this effect at the same low concentration of 14 parts per million of the ration. Human teeth are even more sensitive to the action of fluorine and become mottled when the water supply contains 1 part per million of fluorine. (Foster method of analysis.)

With conclusive evidence of the destructive action of fluorine on the teeth at hand, the increasing use of fluorine compounds as spray insecticides against agricultural pests becomes alarming. Fluorine containing insecticides is being turned to as a substitute for arsenicals, whose toxic action is recognized. Certainly, chronic fluorine poisoning is as little to be desired as arsenic poisoning from the standpoint of public health. The U. S. Pure Food and Drug Department have analyzed such foods as apples, cabbage, cauliflower, celery, broccoli and cucumbers and found them to retain fluorine from three to four months after they had been sprayed on the field with fluorine-bearing insecticides. All compounds of fluorine may not be of equal toxicity. An investigation into the minimum toxic dose for experimental animals and the comparative toxicity of fluorine in different combinations including those used as insecticides seemed desirable.[9] Accordingly, the effect on the teeth, growth rate, reproductive record, food intake and general well-being of rats, from varying concentrations of sodium, potassium, ammonium and calcium fluorides, sodium, potassium, calcium, and barium fluosilicates, and cryolite has been observed over a six weeks' experimental period. In some experiments, the fluorides have been incorporated in the basal ration. In other experiments, the drinking water alone or both the food and the water have contained the fluorides; and, in still other cases, the fluorine compounds have been fed separately in definite weighed amounts.

The effect of ingestion of four different compounds of fluorine on the teeth growth rate and mortality of rats is shown in Table 5.

9. Smith, Margaret C., and Leverton, Ruth M.: Comparative Toxicity of Fluorine Compounds, Ind. & Eng. Chem., 26:791 (July) 1934.

When fluorine is fed as sodium fluoride, a definite stunting of growth appeared at a concentration of 0.0226 per cent of the ration. All the soluble fluorides tested exhibited a toxic effect on growth at the same level of feeding, as did also the less soluble barium fluosilicate which is commonly used as an insecticide spray. When fluorine was combined as calcium fluoride, or as the spray compound cryolite, its toxic effect on growth was much less marked. It required ten times as much fluorine as cryolite and twenty times as much when combined as calcium fluoride to produce the same degree of growth stunting. Again, whereas a concentration of 0.0904 per cent of fluorine as sodium fluoride was fatal, a daily intake of ten times as much fluorine in the form of cryolite was not fatal. This difference in toxicity may be due to difference in solubility of the compounds and therefore in availability.

An effect of fluorine on the teeth of the rats was noted at concentrations of feeding far below the level necessary to interfere with the growth rate. As little as 14 parts per million (0.0014 per cent of the diet or water) of fluorine as sodium fluoride in the drinking water interfered with the normal development of the teeth. Fine lines of alternating normally pigmented and abnormal white areas could be noted by means of a hand lens. (Fig. 9.) As the concentration was increased, there was a proportionately greater interference with tooth development. The teeth lost the orange pigment normal to them and became dull white, and finally the enamel corroded, pitted and chipped off. All of the compounds of fluorine produced this initial effect on the teeth of the animals at the same concentration of fluorine, namely, 14 parts per million.

As little as 0.2 mg. of fluorine daily in any combination studied had a damaging effect on the teeth. Barium fluosilicate, commonly used as a spray insecticide, is as deleterious as sodium fluoride. Evidently, the amount of fluorine required to mottle teeth is so small that differences in solubility of the different compounds of fluorine is no longer a cause of difference in their effect.

When it is realized that only 1 part per million of fluorine in the drinking water supply is sufficient to produce mottled teeth in human beings it would seem the part of wisdom to discourage the use of all fluorine-bearing insecticides regardless of the nature of the chemical combination, for they are all soluble to the extent of more than 1 part per million and the presence of any of them in the food or water supply of human beings in excessive amounts may result in the production of mottling of enamel. For example, analysis showed that apples sprayed with barium fluosilicated had an average fluorine content of 5.6 parts per million.[10] Thus, one of these large apples would provide as much fluorine as 4 glasses of water containing the toxic concentration of 1 part per million of fluorine.

10. Newcomer, E. J., and Carter, R. H.: Studies of Fluorine Compounds for Controlling the Codling Moth, U. S. Dept. of Agr. Tech. Bull. 373, 1933.

TESTING CEMENTS AS A DENTIST WOULD TEST THEM

By W. CLYDE DAVIS, A.M., M.D., D.D.S., Lincoln, Nebr.

A GREAT surprise awaits the dentist who will make the test of cement herewith described. The object of the test is to have a set inlay of glass through which we may look and note the changes.

TECHNIC

1. Take two pieces of plate glass 1 inch square. Grind the surface of one side of these to a complete frosting. This side will represent the wall of the tooth cavity. The other piece of glass is left polished and represents the metal filling surface. We look through this to the cement, after filling.

2. Mix each cement according to the manufacturer's instructions, to the proper consistency for setting an inlay. Coat the frosted surface with cement and cover with the plain half, pressing firmly together between the jaws of a spring paper clip, and place them where the cement will set at 98 F.

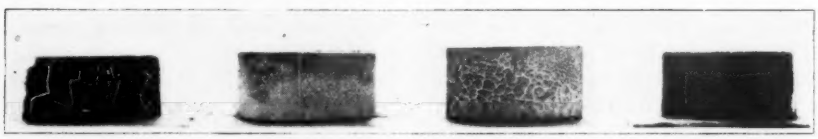
3. Clip off the excess cement on all margins and give them two or three coats of varnish.

4. Before the spring clips are released, set in dental stone to the depth of one-half the glass for a base, leaving the upper edge and half the side edges exposed, still at body temperature. The varnish will prevent any effect which the presence of the stone would have on the results.

5. Lay the cavity margins in saliva and maintain for twenty-four hours at body temperature.

6. Remove and dissolve the varnish from the margins and again return to the saliva bath with a few drops of carbol fuchsin stain added and allow to remain forty-eight hours.

7. Remove and wash and dry, coating the entire exposed cement edge with about three coats of cavity varnish to prevent future external influences except thermal changes.



Results of tests (photographs taken two years after preparation).

One can then note through the clear glass the changes which take place from week to week and month to month. All cements shrink, but some ten times as much as others. Some on their own centers, some on several centers and others on many centers, leaving spaces where no cement remains. Some become a crumbled mass in a few weeks; others seem to maintain their integrity indefinitely. Some stain very badly, while others resist the stain to the end. There is a marked difference in the behavior of cements: said to be (1) preshrunk; (2) very finely ground; (3) built up from different boltings, and (4) have a low acid or a high acid liquid.

The accompanying photograph illustrates certain tests made by the method described.

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Editorials

A SIGNAL TRIUMPH

One of the most important cases concerning the practice of dentistry has just been decided by the Supreme Court at Washington. A copy of the entire decision is given on another page of this issue.

As will be noted, the case was one in litigation between the Oregon State Board of Dental Examiners and the advertising dentists. The Board won out decisively. It is the age-old question of advertising professional service to the public, and the final decision in this case is a matter for congratulation to all ethical dentists, and in no less a degree to our citizens as a whole. The essential element in all litigation is the protection of the people, and their general welfare. Times almost without number ethical members of our profession have sought to show the manifest inequity of dentists' advertising their services in the public print, or in display advertisements of any kind. In all ways and forever, the fact must be recognized that there is a fundamental difference between advertising

a commodity and advertising a professional service. In commercial life, the thing advertised is an inert entity, an article, a commodity; but when an individual advertises his professional skill, he is essentially advertising himself. Aside from the manifest immodesty of such a procedure, there is another feature of professional advertising that is always apparent. It is common knowledge that not in a single instance have we ever found a professional man who advertised truthfully. Misrepresentation and exaggeration are the ordinary stock in trade of the professional advertiser, and while a similar charge may be made of most kinds of advertising, there is this difference: Much greater harm may be done to the public by misrepresenting a professional service than by misrepresenting a commodity. To be deceived in an article of barter is of course disconcerting and may lead to a financial loss, but to be misled by faulty professional advice may well bring about a definite injury to the physical, mental and moral well-being of the person so victimized.

It is probably for this reason that certain of our newspaper press have for some time announced their decision to refuse advertising of a professional character. All honor to the editors and publishers of our lay press who are thus willing to sacrifice income to the end that the public shall be better protected and more efficiently served.

It should be recognized that there is a greater opportunity for deception in advertising professional service than in advertising commodities. Usually, it is possible for the purchaser of some article of apparel or a perambulator or a cook stove to judge with some degree of accuracy the quality of the article that is being advertised, but when it comes to professional service the public, in the very nature of things, is almost wholly ignorant and thus practically helpless. The person who goes to a physician or a dentist must accept the service rendered on faith because he is not able to judge of its quality, and it is therefore all the more important that the person who administers the service be one who is animated by the highest ethical principles.

Not till dentistry assumed a professional status through the formulation of a code of ethics was the public protected and made to recognize the essential difference between practicing dentistry as a profession and following it as a trade, and now that the highest court

in the land has set its seal of approval on the principle that dentistry is a profession, we may confidently look forward to a more general recognition on the part of the community of those high ethical concepts that we have been claiming for dentistry for so many years.

THE APPARENT DIFFICULTY OF ESTABLISHING THE REAL CAUSE OF DENTAL CARIES

In the ever-increasing avalanche of literature on the subject of dental caries, the unprejudiced observer is left floundering in a state of uncertainty and bewilderment. The obvious question to be immediately raised would naturally be: What is the matter with our research workers? The Macedonian cry has gone out on many occasions for an individual or for a group who would solve this problem and lay the foundation for a more logical and concrete plan for preventing or controlling dental caries. This affection is known everywhere as the most prevalent of all human diseases. Then why in the name of humanity have we not made a more effective approach to its solution? Unless this problem is solved soon, we may well expect the charge to be made that we as a profession stand convicted of a dereliction of duty. The apparent futility of meeting the situation with a reasonable degree of success constitutes one of the major reflections on our perspicacity as a progressive and far-seeing profession.

One theory after another is sagely advanced as to the cause of caries, only to be met in turn with almost fatal refutation. The apparent solution of today turns out tomorrow to be little save dust and ashes, and we end by having our hopes constantly dashed. Never has such a vast amount of literature been written with so little concrete achievement, and never have so many men and women of serious mind devoted their energies to the solution of any problem with such apparent futility.

In recent times, diet has been heralded as the significant agency that was to call the turn on this affection, yet diet cannot be all there is to it. Two children in the same family may be brought up with apparently the same diet, and one will be immune while the other

is susceptible. We are baffled time after time in our application of diet to the requirements of a given case. A certain diet cannot be administered to any number of people with a uniform result, in the manifestations either of dental caries or of ill health generally. There is something more to it. Yet, in all this welter of confusion and defeat, it should not be said that our research workers are devoid of acumen or application or brains. The wonder is that so many of them have persistently followed up this study with such apparently discouraging results. No, the fault is not so much with the research workers as it is with the problem itself. The manifestations of dental caries are more confusing and bewildering than are those of any other known disease, and the thing that we once thought was so easy of solution and so near to a solution has turned out the most baffling of all of our problems.

When Miller made his classic pronouncement in the latter part of the last century, it seemed that the final solution of dental caries was "just around the corner," yet today we are forced to ask in retrospect the pointed question as to how far we have gone since Miller laid down his pen.

But we must not assume that all of the faithful work that has been done on dental caries in recent times has wholly gone for naught. It is true that, as we view it today, much of it has had to do with wild eyed speculation and fine spun theories, but here and there a little seed has been sown and a little grain has been garnered for the ultimate harvest.

We make the prediction that if and when the problem of dental caries is eventually solved, the solution will come as the result of close clinical observation combined with research. And there is one phase of our clinical experience that has never been given the attention that it merits. This relates to the manifestations of susceptibility and immunity in the mouths of our patients. Not till the private practitioner studies more carefully than he has in the past the varying behavior of mouths in their reaction to the carious process shall the profession be able to cooperate to the best advantage with the research worker, and not till the research worker recognizes the significance of conditions in the mouth shall the problem of dental caries be solved.

Teamwork is needed in this situation, and no one individual has a mortgage on the knowledge that is necessary. Even with all of the vision that may be mustered, the goal still looms a long way off.

A PRECAUTION IN THE ADMINISTRATON OF ANESTHETICS

It is difficult to imagine that any dentist in this age would ever venture to administer a general anesthetic in his office without the presence of a third party in the operating room. At one time and under pioneer conditions, this practice may have had some justification. In fact, it at times became necessary, if anesthetics were to be administered at all; but, with modern facilities, there is no necessity and no warrant for taking chances of this kind.

Even if an operator does not employ an assistant, there is always some one in the vicinity of the modern office who can be pressed into service for a few minutes in the operator's protection. Usually, a relative or a companion accompanies the patient to the office, or, in any event, some one is usually available as a witness to the operation.

It is common knowledge that hallucinations are likely to occur under an anesthetic, and innocent operators have been charged by the patient with improprieties that never occurred. Nothing can protect an operator under such circumstances except the presence of a third party, and any man is foolish to subject himself to so definite a danger when his protection may be made so certain.

The growing tendency toward malpractice suits renders it all the more important that operators take every precaution to safeguard their interests. For an operator to expose himself to the inconvenience and risk involved in administering a general anesthetic without the most rigid observance of all the precautions at his command is folly of the worst sort.

The blessings of anesthesia are beyond all estimate. Without it, humanity would soon lapse into the most pathetic spectacle of our civilization. Human life would not only be made more miserable, but it would actually be shortened. Suffering would be the common lot of humanity and pain the universal nightmare. Surgery of all kinds would be well-nigh impossible, and what little was attempted

would be handicapped by the agony and writhings of the patient. The stress and strain of an operation without an anesthetic would be an unthinkable tax on patient, operator and nurse, and, in the very nature of things, surgical work would not, and could not, be properly performed. Let it once more be iterated that when anesthesia was discovered by a dentist a little less than a century ago, the greatest blessing was conferred on humanity that has come to the world in the annals of beneficent service, and our profession may well be proud of the boon that was vouchsafed for the welfare of human kind.

Then why take the chance of placing such a benefaction in jeopardy by exposing the operator to the possibility of obloquy and false accusation? Why not protect the dentist when protection is not only possible but also relatively easy?

ANOTHER SESSION OF THE INTERNATIONAL ASSOCIATION FOR DENTAL RESEARCH

The I.A.D.R. representing twenty-seven sections of 400 members and three continents met in Chicago, March 16-17. Forty-eight subjects were presented in ten and fifteen minute periods. Fifty-eight papers, eighteen of which came from workers in the Vienna section, were read by title. Immediately following this came the annual gathering of the American Association of Dental Schools. Taken together, these two bodies provide the forwarding urge of dentistry. They have a common personnel, the activities of the members as one group keeping their activities in the other consequential. As one provides what is to be taught, the other says how it should be taught. The ascent of dentistry is due to the men who have brought inquisitive intelligence, scientific methods to the practitioner's problems, the patient's ills. This essay will confine itself to the group at their investigations.

Two hundred persons attended the meeting of the International Association for Dental Research. Their purpose was attested by their attention. The sessions were attended. The halls were empty when the rostrums were occupied. A deep earnestness gave validity to the intent of the meeting. As one noted the number present, mem-

ory could not be denied its retreat to the days when the few men who essayed to kindle the fire of research and keep it ablaze entreated others to come and paid for their entertainment. One is tempted to give their names, but would rather let the fact be counted as part of their unified effort to advance the scholarship of the profession. For this, in behalf of dentistry, acknowledgment is made to one man who has given inspiration and leadership to the movement that reached the high point of this meeting—the founder of the Association.

In a very definite sense, dentistry came of age with the maturation of this body. For three-fourths of a century, there have been men in dentistry who have known in what the secret of its advance and perpetuity lay, but the profession was not widely leavened by their vision. There were great dentists, but dentistry had not achieved greatness. In this association, research has undergone cultivation, has grown to adult proportions, has permeated the whole and, today, dentistry recognizes itself as a university product, a service of scholarship, and is recognized in the same terms.

Growing rapidly and highly productive, the organization realizes that these two attributes give rise to bothersome problems. Up to the present, publication has been an unquestioned privilege open to all who cared to write on almost anything they cared to write about. This was abetted by journals that accepted anything to swell their bulk and impress their importance. That the articles added no whit to common knowledge mattered not at all. When they did, that whit was often lost in ponderous introduction, long drawn discussion and repetition. If the papers had been prepared as addresses, they had been built to the measure of a generous time limit. The stamp of the chautauqua was on them; they were patterned to parliamentary practice. Even yet, some contributors attempt second printings of their products. So eager are they for publicity that they overlook the discredit of such procedure and leave the job of discovering the original to the editor. The International Association for Dental Research confronts this perplexity.

Publicity has been regarded as a reward for the beginner in research. If his article were printed, he would be encouraged. Research was a means to an end rather than a most impressive end in

itself, until such time as the worker should adjust himself to the only creditable attitude on the matter. What the mortality rate among such men as eventual producers has been statistics do not show, but it is doubtless high enough to indicate that the method is fallacious. The time has come when research for its own sake must be emphasized, the inspiration coming from an appreciation of research itself and the elders who set the example. It is well enough known that results worth the name are not ground out by the week or month; that, except in rare historic instances, greatness has been achieved by a single great accomplishment rather than by countless chronicles. The prolix writer on science goes down in confidence as the heap of his writings goes up. Encouragement to write in the past has become an evil in the present, as every editor knows when he asks for briefer, clearer statement, the deletion of unrelated, unnecessary padding, bombastic phrases that modify the writer rather than other parts of speech. Encouragement to print has developed a state of mind that resents impingement on personal pride. This condition the I.A.D.R. must take steps to improve. The increase in the number of workers and the fewness of the journals together call for a reform if nothing else does. When this condition is corrected, reports will not lie interminably in the editorial files. Economic stress has added its demand as well.

The international character of the association presages another desirable end: the coordination and cooperation of workers to save duplication of endeavor and expense. As the continents decrease in size and draw closer together, this becomes easier. As the field of investigation expands, it becomes more desirable. To date, there has been small thought given to this phase of the endeavor by the endeavorers themselves. There has been no program. Laboratories have been isolated to the point of unconsciousness of what the others across the continent or the sea have been doing. A small amount of the genius applied to research diverted to the features mentioned here and promised by conversations among the workers themselves would result in a distinct gain. At present, twenty-seven sections are operative, productive, moved by a common interest in dental science, but they are disparate and unorganized.

T.

"FORTY-FIVE THOUSAND MEMBERS FOR 1935"

"Forty-Five Thousand Members for 1935." This is the slogan outlined and suggested by Dr. Casto, President of the American Dental Association.

Without doubt, the results will amply justify the slogan. Seven states are now over their quota to make the slogan good and others are very close.

There are 4,500 more members now than at this time last year, and the movement for new members is gaining ground all the while.

What does this imply? It implies several things: (1) that our membership committee with its corps of helpers has been exerting itself for the welfare of the Association; (2) that they have shown acumen and far-sightedness in their work, and good judgment in its execution; (3) that the state and component societies have been most sympathetic in their support and cooperation in every way; (4) that the President and other officers have from the first been solicitous for the best interests of the organization; (5) that the personnel in the Central Office have devoted their best energies in a loyal and cooperative way to build up the organization to the highest pinnacle of perfection both in membership and in the excellence of its service.

Forty-five thousand members for 1935!

THE STUDENT JOURNAL

Student journals and bulletins have recently taken on a noticeable importance. From mere leaflets that catered to the happenings of undergraduate life, the marriage of and births to graduates, jests and cartoons that had intramural meaning only, they have expanded to voting age proportions and construction, the discussion of practical and academic problems, reports of scientific progress, the activities of the professional organization and editorial adventure. This expression, this change of student thought and interest are significant. Should they lose sight of their primary purpose as undergraduate and alumni organs that will be their own affair, but the

widened scope of their endeavor is to the interest of dentistry. First of all, their scientific acumen promises continuity of the upward trend of dentistry. These voices from the schools are prophetic. The practice in scientific statement connotes a better journalism in days to come than has marked the past. Any one who will take the time to read only a few of these publications will observe with pleasure the quality of the writing. It strikes from the start and maintains a level that older journals have difficulty in equaling. The editorials show clearly that youth demands an accounting of the times, insists on a voice in the councils of its elders, fears not to assert its judgments and pledges itself to the best interests of the profession.

T.

"A TOOTH FOR A CHILD"

Every reader is justified in being critical when perusing what purports to be scientific writing. The scientist expects criticism as he himself applies it. And yet betimes, too often in fact, men deserving the name vent popular phrases or essay to dress an idea for popularity. The temptation to do so is always strong in free address, but is not excusable in written form. In both instances, generalizations can give but little credit, and in the latter may cause veritable harm.

To illustrate: "Calcium drain is especially evident in the teeth of mothers, a phenomenon long recognized in the aphorism 'for every child a tooth.'" (R. G. Hoskin in "The Tides of Life.") This quotation from an authoritative text, by a recognized worker in the field of the endocrines, makes the implication that teeth of pregnant women decay more readily than those of nonpregnant women; that teeth are a storehouse of calcium and are subject to calcium withdrawal, and that caries results from lessening of the calcium content of the teeth.

There is no acceptable evidence that pregnant women show a greater incidence of decay than nonpregnant women of similar age. The decay of the teeth of pregnant women is not a corollary of gestation. Furthermore, caries and the state of calcium metabolism

are not in causal relationship. This has been proved by Black[1] and Turkheim.[2] Nor does calcium withdrawal find any illustration in dental physiology or pathology. Withdrawal is difficult of proof on many counts, particularly the absence of an adequate circulatory system in the tooth. Even if in slight measure some calcium is surrendered by teeth, evidence should be produced before such a sweeping statement is made.

In *The Journal of the American Medical Association,* Albright, Aub and Bauer say:

> Despite the fact that the bones are the storehouse of calcium and phosphorus of the body, the teeth do not take part in the generalized decalcification. They may fall out because of disease of the jaws but they remain well calcified. This is brought out strikingly by roentgenograms in which the well calcified teeth stand out sharply against the poorly calcified jaws. This failure of the teeth to become decalcified is featured as strong evidence against their being a reserve supply of calcium.

Medical literature abounds with references to "poor teeth," a pair of words as meaningless as the "corroding humors" of Galen. Any dental or gingival dystrophy is included, but "poor teeth" specifies nothing and everything.

Most fantastic and imaginative of all is this:

> The endocrine glands also possess an influence upon the variations in size of individual teeth, and here again certain generalizations have been worked out, which give one a clue to the general endocrine constitution of the individual and also help in a therapeutic approach.
>
> The pituitocentric type tends to have teeth that are either too large or too small, and this applies particularly to the central incisors.
>
> It is a curious fact that the upper lateral incisors have some definite relation to the gonads.
>
> The canine teeth are also related to the adrenal glands.

These are quotations from Louis Berman,[3] author of the book "The Glands Regulating Personality."

These statements are cleverly imaginative and suggest insight of high degree, but they classify with the writings of Hans Christian Andersen or Jules Verne. Similar ones may be found in almost any field of endeavor. These have been chosen because of their close relationship to our interest. A new idea, a new discovery, anything new that promises to have importance draws for a division of

1. Black, G. V.: Operative Dentistry, Vol. 1, pp. 118-121.
2. Turkheim: Karienforsch. Ftschr. d. Zahneilk., 1933, p. 359.
3. Berman, Louis: Some Relations of Teeth to Endocrine Glands, D. Cosmos, 67:35-41 (Jan.) 1925.

spoils. As business snatched at calories, as vitamins are used to vitalize sales, men of better expectation reach for a share in scholastic credit and praise. A few years ago, cytoplasmic particles were descried and described in cells, mitochondria. They were new and glamorous. What were they, what their function? Volumes were written of speculation. They were particles of lecithin! A scientist of international renown determined to lift the fog of uncertainty and give mitochondria a characterization of fact. He says that they are not lecithin. He is not counting the minutes of his progress, nor his fame in the number of printed words. He seeks only to make his pronouncements indisputable. Another may point to the disappearance of the shelved guesswork in the libraries and still another to the wasted expense of their publication. What he finds will not be ponderous, but it will be permanent.

"All generalizations may be wrong, including this one." Hence, the danger of their employment. The generalization that is wrong is to be excluded at the beginning. Popularizing untruths or unproved fancies, broadcasting ancient and meaningless aphorisms or the alliterative phrase loaded with misconception, deception and personal sale has no place in a scientific paper and should be forbidden by any scientist. A listening, reading public responds to such proclaiming with both faith and doubt, according to their intelligence. Either the believer or the unbeliever may be an embarrassment to the scientist or his cause.

T.

Obituaries

FRANK TURNER TAYLOR, D.D.S.
(1864-1934)

Frank Turner Taylor was born in New Bedford, Mass., June 23, 1864, the son of James and Elizabeth Jane (Stoddard) Taylor. He died in Bridgewater, Mass., Dec. 10, 1934.

He was educated in the New Bedford public schools, and subsequently attended Bridgewater Normal School, graduating in 1881. He was principal of the Yarmouth (Mass.) High School (1885-1887) and left that position to study dentistry. He entered the Harvard Dental School in 1888 with one year's advanced standing. He attended the dental school two years (1888-1890).

FRANK TURNER TAYLOR, D.D.S.
1864-1934

Dr. Taylor was married to Nellie Terese Mansfield in Boston, Mass., May 10, 1894.

He served the Harvard Dental School faithfully in different capacities for nearly forty years. He was a life member, secretary (1910-1915) and president (1916-1917) of the Harvard Dental Alumni Association; member of the Harvard Odontological Society; member and president (1917) of the Massachusetts Dental Society, and member of various committees of the Metropolitan District Dental Society of the M.D.S.; a member of the American Academy of Dental Science; and Trustee of the American Dental Association (1924-1931). During the World War, he was a captain in the Dental Corps of the Massachusetts State Guard.

Dr. Taylor's sound judgment, high ideals, and fairness towards everyone, made him a valued member of the dental profession, in whose behalf he gave unstintingly of his time and counsel.

ALFRED OWRE, D.M.D., B.A., M.D., C.M., Sc.D.
(1870-1935)

Alfred Owre died Jan. 2, 1935, at Beth Israel Hospital in New York City. He is survived by his wife, Franc Charlotte Hockenberger, a daughter, Alice Cecelie, and a son, Alfred. He was born Dec. 16, 1870, in Norway, and his early education was received in Europe. In 1894, he received the degree of D.M.D. from the University of Minnesota, and in 1910 the degree of B.A. In 1895, he received the degrees of M.D. and C.M. from the College of Physicians and Surgeons of Hamline University, and, in 1929, he received the degree of Sc.D. from Columbia University. Before graduation, during 1893-1894, he was student assistant in operative dentistry, and in 1895-1896, instructor in dental metallurgy. He was made professor of operative dentistry in 1899, and dean and professor of theory and practice from 1905 to 1927. During his administration, he developed the dental department of the University of Minnesota into one of the soundest and best-known schools of dentistry in the country. In this development, he was intimately associated with the College of Medicine.

In 1927, he was called to be dean and professor of theory and practice of dentistry at the School of Dental and Oral Surgery of Columbia University. He took with him from Minnesota Dr. Rowe and Dr. Leonard to assist in the reorganization of the teaching. He succeeded Dean Van Wort and was brought to Columbia primarily to coördinate the schools of medicine and dentistry, and to integrate dentistry as a part of the Presbyterian Hospital and Health Center.

For twenty years, Dr. Owre was one of the most active and influential men in the advancement and development of dental education. He was one of the leading spirits in the Dental Faculties Association of American Universities, which probably had more influence in the improvement of dental education, its establishment upon university principles, and the development of university methods in the field than any other dental educational organization.

Dr. Owre was possessed of a keen brain and enormous intellectual energy. He was a philosopher rather than a scientist, but the extent and accuracy of his information was astounding. He was especially interested in oriental philosophy and art. He was

ALFRED OWRE, D.M.D., B.A., M.D., C.M., Sc.D.
1870-1935

a member of the Archaeological Institute of America, the Japan Society of London and the Asiatic Society of Japan. He was a member of all of the important dental associations and international dental congresses and an honorary member of Den Norske Tandlaege Forening.

Dr. Owre's favorite method of travel was on foot. He had made many journeys, covering most of the United States, parts of Canada and a great deal of Europe. On many of these journeys, he was accompanied by his wife. On these trips, he lived with the people among whom he journeyed, studied their conditions of life, their mental and spiritual attitudes and their relations to their environment. He read and spoke fluently French, German, Russian and his own Norwegian, and was only less accomplished in Spanish and Italian. He had made many journeys through Europe and especially in Russia, both under the empire and under the Soviet Republic. He was keenly interested in the possibilities inherent in the attempt of the Russian people to develop a civilization based upon service to humanity rather than upon the accumulation of dollars.

The broadness of his intellectual horizon, the richness of his human experience and sympathy, and the keenness of his humor made Dr. Owre a delightful companion. He was one of the most intellectually stimulating persons I have ever known. Dr. Owre had supreme confidence in the ability of the human mind to overcome any obstacles of environment. He was fearless in combating the tendencies to prostitute the profession, both in practice and in education, to financial gain, and this won for him many bitter enemies. He died a martyr to his principles and ideals and left the dental profession a debt which can be paid only in honoring his memory.

FREDERICK B. NOYES.

Death of Wilhelm Dieck: Wilhelm Dieck, one of the most prominent teachers in the University of Berlin Dental Institute, died Feb. 28, 1935, at the age of 68. The cause of his unexpected death was apoplexy. Dieck was a student of W. D. Miller, occasionally substituted for him and followed him as a regular professor on the Berlin University Dental Institute faculty. In the March issue of THE JOURNAL, the leading contribution was a biographical sketch of Miller's life by Dieck, an affectionate portrayal of his place in dental education and science, a literary memorial. In 1928, Dieck became director of the Berlin Dental Institute. His greatest service was the introduction of the roentgen rays in dental diagnosis and his most significant production "The Anatomy and Pathology of Teeth in Roentgenography," which appeared in 1911. Dieck took the greatest possible interest in professional affairs in behalf of science and the profession itself. He was honored in many ways, among which were the bestowal of the gold medal of the Central Association of German Dentists and the Miller Medal from the F.D.I., which trophy was designed as a reward of merit in honor of his great teacher. All who knew Wilhelm Dieck as a teacher will hold him in honored memory.

T.

PRACTICE IN PARAGRAPHS

This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.

Waxing Indirect Inlay—In making an indirect inlay, instead of forcing the soft inlay wax on the amalgam die, use thin pink sheet casting wax and burnish to the model as you would platinum, then build the blue inlay wax on for shaping the inlay. *R. S. Neyland, Jackson, Miss.*

Research *vs.* Complaint—The 64,678 dentists in the United States should at once begin to make a comprehensive examination of their profession. Capitalizing the virtues rather than bemoaning the shortcomings of materials and technics now in use would soon elevate the great dental profession of today to the greatest profession of tomorrow.—*Herbert Ely Williams, Red Bank, N. J.*

Why "In Mourning"?—When ordinary scrubbing with brush and soap will not thoroughly clean the cuticle and finger nails, dip the finger tips, while yet wet, in dry sodium perborate and, with a small wisp of cotton secured on the flat end of a wooden toothpick, work this under and around the nails. Now scrub again with the nailbrush and relieve yourself of the embarrassment of nails "in mourning."—*Ryland O. Sadler, Baltimore, Md.*

Paper Napkins—Prior to the World War, I used linen napkins and towels at the chair. I now use the towels as bibs and to protect the clothing of my patients, but for the patient's personal use, I find a good grade of full bleached crepe napkins most satisfactory and very cheap. I buy the Saranac Wigwam 13½ by 13½ flat brand in 10,000 lots of the Cauthorne Paper Co., P.O. Box 2059, Richmond, Va.—*Ryland O. Sadler, Baltimore, Md.*

Not New—Do not forget to reinforce your angle synthetic porcelain fillings with gold anchor screw wire S.S.W., No. 9. I have had great success in restoring these angles on anterior teeth by using one or more of these little threaded pieces of this wire first cemented to place, and then making the synthetic filling in the usual way. Best results are always had by waiting twenty-four or more hours for polishing.—*Ryland O. Sadler, Baltimore, Md.*

Income—In fairness to both the patient and oneself, there should be a consistent fee charged for every operation performed at the chair, else the hours will slip by and there will be nothing to show for it. One's overhead goes on with the regularity of the clock's ticking. There is no old age or pension system in the profession, so it behooves the dentist to lay by more than an umbrella for the "rainy day." To safely invest as small an amount as two dollars per working day that could be easily given away without thinking would go a long way toward an old age pension and ease of mind.—*Ryland O. Sadler, Baltimore, Md.*

Inducing General Anesthesia for a Patient with a Bleeding Mouth Wound—When a patient comes in for the removal of a tooth, extraction of which has been already attempted by another operator, and there is profuse hemorrhage, the dentist is frequently in a difficult position. While the inhaler is in position, the mouth is filling with blood, and this may complicate the anesthesia. A wad of gauze should be placed over the bleeding area and the rubber mouth prop be applied on this gauze. After the patient is anesthetized, another prop is applied to the opposite side of the mouth, and the operative procedure is commenced on the bleeding side.—*M. Hillel Feldman, New York City.*

Notification Cards—When I have finished the indicated work for a patient, I note on the chair chart for my secretary's information the date when I think the patient should return for prophylactic care and examination. The usual period is six months, though this may be shortened if conditions indicate it. We have, first, the names of the patients as a whole classified alphabetically, and then these are gone over at certain periods and put in the monthly list, from which the notification cards are sent out under a sealed envelope. If the proper judgment is used in sending these cards, the responses more than pay. I prefer the card system in keeping this record.—*Ryland O. Sadler, Baltimore, Md.*

To Repair a Fixed Bridge, First Molar to Cuspid—The cuspid three-quarter crown was loose and the tooth decayed. To remove the bridge, a small hole was cut on the buccal surface of the molar crown deep enough to insert a small instrument between the crown of the tooth and occlusally from the crown and the bridge was worked loose. To repair the bridge, the cuspid was prepared for a three-quarter crown. Soft wax was put in the cuspid of the bridge and forced to place in the mouth. The wax was trimmed as for the inlay and removed. The wax was removed from the bridge and cast as an inlay. The inlay was placed in the tooth and the bridge fitted over it. As the bridge in question had a hole worn in the lingual surface, the hole was cut larger and the inlay soldered to the bridge. The two could be cemented on the teeth at the same time without soldering together.—*R. S. Neyland, Jackson, Miss.*

Return of the Metals—Gold foil has at last been reestablished as an essential in operative dentistry. And it is hoped that no unfair advantage will be resorted to in the exploitation of the inlay. Improvement in the inlay has become so marked since 1908 that like the proverbial wash tub it "must now stand on its own bottom." It is just as unfair and misleading to call a gold inlay a gold filling as to call a gold foil filling an inlay. When patients are told that gold is coming back, they naturally infer that all dental golds are enjoying the return trip, when, as a matter of fact, the inlay has never been away anywhere. There are several 83-year-old gold foil fillings in the mouth of a centenarian residing in New York City. Allusion to such long life fillings of gold might easily and unfairly be represented to unsuspecting patients as inlays. Many dentists have been conducting a gold foil whispering campaign for fear their patients might actually want something so good and so lasting. From now on let us call a spade a spade and mean it.—*Herbert Ely Williams, Red Bank, N. J.*

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The following articles have been accepted as conforming to the rules of the Council on Dental Therapeutics of the American Dental Association. The Council desires dentists to understand that the admission of an article does not imply a recommendation. A copy of the rules which govern the Council in the consideration of articles will be sent on request.

SAMUEL M. GORDON, *Secretary.*

ANESTHETICS—LOCAL*

Procaine Hydrochloride, U.S.P.—(See Accepted Dental Remedies, 1934, p. 40.)

Novocain: A brand of procaine hydrochloride, U.S.P.

Manufactured by Winthrop Chemical Company, Inc., New York. U. S. patent 812,554 (Feb. 13, 1906; expired) by license of the U. S. Federal Trade Commission. U. S. trademark 53,072.

Novocain Solution 2%-Cook: Each cubic centimeter is said to contain: novocain, 0.02 gm. (2 per cent); sodium bisulphite, 0.001 gm.; potassium chloride, 0.00040 gm.; sodium chloride, 0.00375 gm. and distilled water to yield an isotonic solution.

Manufactured by Cook Laboratories, Inc., New York City.
Novocain Solution 2%-Cook in Cartridges, 2-2.5 c.c.

Novocain-Epinephrine Solution A-Cook: Each cubic centimeter is said to contain: novocain, 0.02 gm. (2 per cent); epinephrine, 0.00002 gm. (1:50,000); sodium bisulphite, 0.0015 gm.; potassium chloride, 0.00040 gm.; sodium chloride, chloride, 0.00375 gm.; and distilled water to yield an isotonic solution. The epinephrine is added in the form of suprarenin.

Manufactured by Cook Laboratories, Inc., New York City.
Novocain-Epinephrine Solution A-Cook in Cartridges, 2-2.5 c.c.

Novocain-Epinephrine Solution AB-Cook: Each cubic centimeter is said to contain: novocain, 0.02 gm. (2 per cent); epinephrine, 0.00004 gm. (1:25,000); sodium bisulphite, 0.0015 gm.; potassium chloride, 0.00040 gm.; sodium chloride, 0.00375 gm. and distilled water to yield an isotonic solution. The epinephrine is added in the form of suprarenin.

Manufactured by Cook Laboratories, Inc., New York City.
Novocain-Epinephrine Solution AB-Cook in Cartridges, 2-2.5 c.c.
Novocain-Epinephrine Solution AB-Cook in Ampules, 2.5 c.c.

Novocain Solution 2%-Waite: Each cubic centimeter is said to contain: novocain, 0.02 gm. (2 per cent); potassium bisulphite, 0.00046 gm.; in vehicle composed of ortho and para-mono-iodo-phenols, 0.0002 gm.; potassium iodide, 0.00015 gm.; glycerine, 0.125 c.c. and distilled water.

Manufactured by the Antidolor Mfg. Co., Inc., New York City.
Novocain Solution 2%-Waite in Cartridges, 2-2.5 c.c.
Novocain Solution 2%-Waite in Ampules, 1.5 c.c.
Novocain Solution 2%-Waite in Ampules, 2.5 c.c.
Novocain Solution 2%-Waite in Ampules, 3 c.c.
Novocain Solution 2%-Waite in Bottles, 30 c.c.
Novocain Solution 2%-Waite in Bottles, 60 c.c.

Novocain-Epinephrine Solution No. 2-Waite: Each cubic centimeter is said to contain: novocain, 0.02 gm. (2 per cent); epinephrine, 0.00002 gm. (1:50,000); potassium bisulphite,

*Accepted Dental Remedies, 1934, p. 32.

0.00046 gm.; in vehicle composed of ortho and para-monoiodo-phenols, 0.0002 gm.; potassium iodide, 0.00015 gm.; glycerine, 0.125 c.c., and distilled water. The epinephrine is added in the form of suprarenin.

Manufactured by the Antidolor Mfg. Co., Inc., New York City.

Novocain-Epinephrine Solution No. 2-Waite in Cartridges, 2-2.5 c.c.
Novocain-Epinephrine Solution No. 2-Waite in Ampules, 1.5 c.c.
Novocain-Epinephrine Solution No. 2-Waite in Ampules, 2.5 c.c.
Novocain-Epinephrine Solution No. 2-Waite in Ampules, 3 c.c.
Novocain-Epinephrine Solution No. 2-Waite in Bottles, 30 c.c.
Novocain-Epinephrine Solution No. 2-Waite in Bottles, 60 c.c.

Novocain-Epinephrine Solution No. 4-Waite: Each cubic centimeter is said to contain: novocain 0.02 gm. (2 per cent); epinephrine, 0.00004 gm. (1:25,000); potassium bisulphite, 0.00046 gm.; in vehicle composed of ortho and para-monoiodo-phenols, 0.0002 gm.; potassium iodide, 0.00015 gm.; glycerine, 0.125 c.c., and distilled water. The epinephrine is added in the form of suprarenin.

Manufactured by the Antidolor Mfg. Co., Inc., New York City.

Novocain-Epinephrine Solution No. 4-Waite in Cartridges, 2-2.5 c.c.
Novocain-Epinephrine Solution No. 4-Waite in Ampules, 1.5 c.c.
Novocain-Epinephrine Solution No. 4-Waite in Ampules, 2.5 c.c.
Novocain-Epinephrine Solution No. 4-Waite in Ampules, 3 c.c.
Novocain-Epinephrine Solution No. 4-Waite in Bottles, 30 c.c.
Novocain-Epinephrine Solution No. 4-Waite in Bottles, 60 c.c.

Suprarenin (See New and Nonofficial Remedies, 1934, page 199.)

Manufactured by Winthrop Chemical Company, Inc., New York City. U. S. Patent 986,156 (March 7, 1911; expired.)

R.C.F. "F" POWDER, "C" SOLUTION, "R" SOLUTION, OBTUNDENT AND SOLVENT—NOT ACCEPTABLE FOR A.D.R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

R.C.F. is the name given to a group of drugs for the treatment of a number of conditions of the hard and soft structures of the mouth by the Lindley Laboratories, Philadelphia, Pa.

The preparations, five in number, are marketed in small bottles each holding about one third of a fluid ounce. They are labeled: R.C.F. "F" Powder, R.C.F. "C" Solution, R.C.F. "R" Solution, R.C.F. Obtundent and R.C.F. Solvent. These five bottles sell for $10, C.O.D. A statement of composition does not appear on any of the labels.

One Stuart Kabnick, D.D.S., looms large in the promotion. He is reported to have given clinics in his office and elsewhere on the treatment of a wide range of dental conditions with this group of products. Information available to the Council reveals that Dr. Kabnick makes a number of statements and adopts a number of methods far out of line with conservative and rational dental procedures and knowledge.

One correspondent writes:

During the course of his lecture, Dr. Kabnick made extravagant claims for his method of root canal therapy, such as: (1) one of the solutions contains "the chemical equivalent of the active principle of maggots," which material he claims to have isolated more than ten years ago; (2) one of the solutions neutralizes the acidity which is always present in infected bone, and just as soon as acidity is neutralized, infection is overcome and regeneration of the bone tissue takes place; (3) the cement which he ultimately uses to fill the canal expands up to 15 per cent of its mass on setting, and the amount of expansion is always under the control of the operator; (4) the rubber dam is entirely unnecessary; (5) the tooth is not sealed after placing the medicament in the root canal until almost the last treatment; (6) he never has to

treat a tooth for more than four or five sittings, usually only two or three; (7) bacteriologic tests to determine the sterility of the tooth before filling the canal are unnecessary because he has made these tests innumerable times and has invariably found the teeth to be sterile; (8) he has also made histologic preparations of the periapical tissues of previously infected teeth of dogs treated by his method and these preparations always showed normal bone tissue after treatment.

Dr. Kabnick refused to divulge any information either about the details of his technic (other than already stated) or about the material because attempts had been made to analyze the materials, and as yet he was not ready to divulge the formulas.

I requested some material on several occasions, but he put me off. He later told me that he was afraid that the solutions would be analyzed and his secret formulas made public.

I managed to obtain some "R.C.F." and made some studies and deductions. On examination of the material I believed it to be an appropriation of Dr. Howe's silver nitrate solution (minus ammonia) and "Osogen." I prepared substitutes for "R.C.F." and carried out bacteriologic tests. A 50 per cent solution of silver nitrate gave about the same bactericidal effect as the original "R" solution. Osogen fluid, solution "C" and my substitute (10 per cent KI and HgI_2) all gave the same degree of bacterial inhibition. Osogen powder, "F" and my substitute (barium sulphate 38, magnesium chloride 32, mercurous chloride 3, thymol iodide 1.5 parts by weight) also compared favorably with one another.

So far as determining the degree of expansion of the cement ("C" and "F") is concerned, I drew out four small capillary tubes and drew some freshly mixed cement into these tubes. Two were sealed at both ends, two were sealed only at one end, with wax. One of each kind was then kept in the incubator at 37 C. and the other two were kept at room temperature . . . observations were then made . . . no expansion, but a slight contraction of the cement was observed.

I also treated extracted teeth by Dr. Kabnick's method using either original "R" and "C" solutions or their substitutes and found that although x-ray films of such teeth show what looks like well-defined root fillings, actually the canals of such teeth are practically empty. I am enclosing evidence of this statement in the form of x-ray films, prints and original teeth. The silver nitrate and potassium mercuric iodide apparently line the canal and being radiopaque give the appearance that the canal is filled. Actually a probe can be passed easily into the canal.

This much of a lengthy communication is given in detail since its corresponds with other information available concerning the R.C.F. treatment and Dr. Stuart Kabnick.

In the early part of 1933, a piece of advertising for R.C.F. products appeared. This was entitled "A New and Scientific Approach to the Treatment of Several of the Diseases of the Oral Tissues," by Stuart Kabnick, D.D.S., F.A.I.C. Directions for the use of the several R.C.F. preparations for treating a number of dental conditions are given. Among them are:

Medication and filling of teeth with nonvital pulps, for treating sensitive dentine and exposed cementum, for pyorrhea and cases of traumatic occlusion, for sterilization of dentine and as an adjunct to the pulp tester, for preventative dentistry for children, for alkalinization of necrotic tissue and treating blood clots, for treatment of soft tissues for immediate insertion of dentures, for cases of dry sockets and for allaying pain incident thereto, and for granuloma or abscesses after extraction.

Here are some of the statements appearing in this "new and scientific" approach to the treatment of diseases of the oral tissues.

Under treatment and management of teeth with nonvital pulps:

Sterilize the field of operation by placing cotton rolls and blowing "F" powder over the area involved, making sure that you reach the deeper points of the interproximal spaces. *This procedure will prove to be a much more satisfactory protection against the flora of the oral cavity than the cumbersome rubber dam.* (Italics not in original.)

The treatment consists, then, of treating with "R" solution and "C" solution, leaving the root canal open between the three treatments suggested. Finally, the root canal is filled with a cement made by mixing "C" and "F." Note the following use of high sounding but meaningless language: "If roentgenogram shows that chemotaxis approaches the

entrance of the canal or canals . . ." Dorland's American Illustrated Medical Dictionary defines chemotaxis thus: "The phenomena shown by certain living cells of moving toward or away from certain other cells or substances which exert a chemical influence." It is left to Dr. Kabnick to explain how this phenomenon takes place in the root canal where the R.C.F. preparations are used.

During the third visit or treatment for uncontrollable purulent discharge, the canal is lined with C and F cement, which is manipulated in such a way as to leave a channel in the cement "through which the pus may flow and at the same time the beneficial values of the R.C.F. are present." Instruction continues to *"leave the tooth open"* for seventy-two hours and then seal the channel.

"Where one encounters gutta percha pulp canal points, the R.C.F. solvent will aid in removing them."

The group of chemicals in R.C.F. Obtundent "will be of great service in treating teeth with sensitive dentin" and also for exposed cementum.

Paradentosis without regard to type or differential diagnosis is treated, after complete oral prophylaxis and correction of traumatic occlusion, by swabbing out all interdental spaces, gingival troughs and all disease pockets present around the posterior teeth with "R" solution, followed with "C" solution. After repeating with the "R" and "C" solutions, the pockets are packed with a paste of "C" and "F." This procedure is carried out twice a week for two weeks and then once a week until all gingival discharges have disappeared. No case histories, no control and no preoperative and postoperative histories are given. No reference to the use of silver nitrate and stronger tincture of iodine known as Adam's method is given. From the report of the chemist, it appears that this new method is an unessential modification of that well-known method for treating necrotic gingivitis.

Even more is in store for those who care to read farther. The R.C.F. treatment is said to serve as an adjunct to the use of the pulp tester. The dentin is treated with "R" solution followed with "C" solution, but let the test be described in Dr. Kabnick's own words:

> This will give a slight but sudden shock in all *vital* teeth—and we can note the following color changes: deep orange to red, then light orange, then yellow and finally a white cement forms, that is slightly alkaline. It shows poor thermal and electrical conductivity. These are very important characteristics, for the alkalinity stops the action of acids of the cements.

The series of color changes described by Dr. Kabnick is what may be expected when solutions of silver nitrate and potassium mercuric iodide react. The resulting precipitate is essentially a mixture of silver chloride and silver iodide. This reaction has not been shown to be useful as a test for vital pulps; nor does Dr. Kabnick adduce evidence that it does indicate vitality of the pulp. A little experimentation will show how far this statement is from fact. When "C" and "R" solutions were mixed, it was found that blue litmus paper turned to red; which indicated an acid reaction.

The high point of the advertising is Dr. Kabnick's contribution to "Preventative dentistry for children." Here one finds a mixture of little fact and much exaggeration. He writes:

> I think the greatest contribution of service to any patient is rendered if the treatment is started as early in life as the very onset of the dental disease. Why wait until the entire oral cavity is involved? The deciduous tooth with a nonvital pulp that goes untreated has greater potential powers of destruction in the whole human mechanism than the untreated second or "permanent" tooth with a nonvital pulp. The general mixing of the purulent exudate or discharge from such a deciduous tooth with all foods taken into the oral cavity presents a menace to the child's health that may influence its growth, its mentality, and its whole physical development. Toxins, enzymes, and the end products of putrefaction in large doses will retard healthy development of the child.

And so on, but if one reads still farther, he will learn, "This can all be prevented if the problems of carious deciduous teeth are approached scientifically."

The scientific approach apparently comes by the use of R.C.F. at $10 a package. The decalcified dentin and periapical tissues can be "alkalinized" by "R" and "C" and "F," it is claimed. The prospective user is advised to have no concern if some of the mix of the powder and liquid goes beyond the apex, for "the material is readily accepted by the tissues" and "it will be absorbed in a few weeks." Further, "the canal filling will be destroyed as rapidly as the root is taken away. . . ." The ridiculousness of the statement appears from the probable composition of the "F" powder described farther on.

All of this and more appears in this "scientific" contribution of Dr. Stuart Kabnick. At the end of the booklet, the reader is greeted with the following announcement:

> Lindley Laboratories, Incorporated of 1510 Lindley Avenue, Philadelphia, Pa. announces to the Dental and Medical Profession that it has been granted the sole rights for the ethical distribution, in the United States, of all R.C.F. products developed in the research laboratories of Stuart Kabnick D.D.S., F.A.I.C.

Information from the Department of Revenue of the Commonwealth of Pennsylvania shows that Stuart Kabnick is president of Lindley Laboratories, Inc. The letters F.A.I.C. (Fellow American Institute of Chemists) appear after Dr. Kabnick's name in the advertising. A survey of the author indices of *Chemical Abstracts* does not reveal any contributions to chemistry by Dr. Kabnick. Stuart Kabnick received the degree D.D.S. from the University of Pennsylvania in 1921, but no contribution from his laboratories or under his name appears until 1933. In the October, 1933, issue of the *International Journal of Orthodontia* appears an article, "Should Deciduous Teeth with Nonvital Pulps Be Treated?" by Stuart Kabnick, D.D.S., F.A.I.C. This article is replete with scary prognostications, extravagant and unwarranted statements that do not call for repetition. Enough has been said above, but the choicest piece is: "The results obtained by hundreds of general practitioners in treating teeth with nonvital pulps by my technic. . . ." Nothing can be found in the dental literature to give support to this sweeping statement.

WHAT IS R.C.F.?

In order to give the Lindley Laboratories, Inc., and Stuart Kabnick an opportunity to remove their preparations from the category of secret remedies, two communications were sent to the Lindley Laboratories, Inc. Finally, Dr. Kabnick informed the Council that "for business reasons the corporation producing R.C.F. has to date kept secret its composition." Stuart Kabnick, D.D.S., president of the Lindley Laboratories, Inc., evidently forgets that it is not only the duty but also the right of the dentist to know the composition of every drug he uses or prescribes. In view of the failure of Dr. Kabnick to avail himself of the opportunity to place before dentists the composition of R.C.F., the A.D.A. Bureau of Chemistry examined the preparations. The Bureau report is as follows:

R.C.F. Solvent was found to be nothing more than xylene.

R.C.F. Obtundent was found to contain benzyl alcohol.

R.C.F. "R" Solution was found to be approximately a 40 per cent solution of silver nitrate.

A powder having the essential properties of R.C.F. "F" powder can be made by mixing together barium sulphate, U.S.P., 50 parts, magnesium oxide, U.S.P., 25 parts, zinc oxide, U.S.P. 20 parts, calomel, U.S.P., 3 parts, and thymol iodide, U.S.P., 2 parts by weight.

R.C.F. "C" Solution was found to be variable in composition, at times being a solution of mercuric iodide in potassium iodide; at others, an aqueous solution of mercuric iodide in potassium iodide and magnesium chloride.

It is apparent, then, that Dr. Kabnick's R.C.F. preparations are nothing more than well known drugs or combinations put out under secrecy and at exorbitant prices. It may also be noted that the experiences of the Council's correspondent agree on the whole with these findings. Readers will recognize the "C" solution and the "F" powder as being essentially similar to a product formerly marketed as Osogen.

In view of the foregoing, the following R.C.F. preparations: "F" powder, "C" solution, "R" solution, Obtundent, and Solvent are declared unacceptable for A.D.R.

SAL HEPATICA—NOT ACCEPTABLE FOR A.D.R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Sal Hepatica, marketed by the Bristol-Myers Company of New York, is a product sold directly to the public and advertised to dentists, by mail and in commercial exhibits of those dental societies which have not put up the bars against advertising products of this class. The usual free samples are liberally supplied to dentists for distribution to their patients.

Other than "effervescent saline combination," a statement of composition does not appear on the label. Circular advertising reads: "Sal Hepatica has been made and blended with never a change in its formula for over 40 years."

Advertising in certain dental journals reads:

The regular elimination of waste products is a necessary adjunct to prophylaxis in treating certain oral disturbances.

Calcareous deposits, salivary débris, thick ropy saliva yield to the corrective influence of Sal Hepatica.

Sal Hepatica is a mild effective laxative and eliminant. It follows up the dentists' prophylactic treatment of the "vestibule" with a healthy cleansing of the intestinal tract.

Materially aids in the treatment of pathologic oral diseases by thoroughly cleansing the intestinal canal.

Thick ropy saliva is conducive to acid retention in the oral cavity. Dentists recognize that gastric irritation and the failure of the eliminative organs to function normally results in a more highly mucinated saliva.

The intestines become clogged. The kidneys are less active and the blood stream is overloaded.

Sal Hepatica has met with the unqualified approval of the dental profession as an efficient saline laxative for the flushing of the intestinal canal. It accelerates the removal of waste materials and prevents fermentation and excessive accumulation of toxins. Sal Hepatica stimulates the absorptive, excretory and motor functions of the alimentary tract and so is unqualifiedly recommended as an aid in relieving unpleasant and undesirable conditions in the oral cavity.

The lay advertising of Sal Hepatica in recent years strikes another but even more indefinite note. The appeal to feminine readers is:

"Cosmetics, however good, and creams, however fine, guard only the surface of your skin" but internal cleanliness must be watched. The user of cosmetics and creams "should know the virtues of the saline method—for the surest simplest way to internal cleanliness is with Sal Hepatica—the saline way to a clear healthy system."

What may be expected of the saline method is this: "Colds and acidosis, rheumatism, headaches and auto-intoxication are driven away. Digestions are regulated. Complexions are cleared. For salines purify the blood stream."

These then are today's claims for Sal Hepatica. Like most patent medicine advertising, the claims abound in generalities, in inferences—supplying enough information for the uninformed reader to infer that he or she should use Sal Hepatica regularly. Sal Hepatica

is not a newcomer in the nostrum fold. It was put on the market in 1895. It has been the subject of several reports in the *Journal of the American Medical Association* and an account of it appears in the book "Nostrums and Quackery," published by that association. It was declared not acceptable for New and Nonofficial Remedies, in 1914. In 1921, it was again discussed by the *Journal.*

In those early days, Sal Hepatica was offered for:

Derangements of the stomach and liver
Affections of the kidneys
Bilious attacks
Summer complaints, colic and alcoholic excesses
Headache, dizziness, heartburn and seasickness
Acute indigestion
Gastric, hepatic and renal disorders

It was also said to be "Especially beneficial in rheumatism and gout."

Thus, by the magical ink of advertising, in recent years it has become an aid to oral prophylaxis, in dental pathologic conditions and to intestinal cleanliness, whatever that may be.

In view of the earlier and more recent analysis given below, Sal Hepatica is seen to be nothing more than an effervescent solution of sodium sulphate (Glauber's salt). Adequate evidence is not available that the regular use of Sal Hepatica or any purge in connection with the indefinite mouth conditions mentioned above is necessary or even desirable. Surely, the attempt to persuade people to indulge in indiscriminate purging is pernicious, to say the least. The dangers of the constant use of laxatives and cathartics is now generally recognized. Almost a quarter of a century ago, the *Journal of the American Medical Association* expressed itself thus:

> The abuse of saline cathartics by the public is an evil deserving of serious attention. Rightly or wrongly, the laity fear constipation and naturally take what they are taught to believe is the cheapest and simplest course for its relief: self drugging by means of saline cathartics or the extensively advertised purgative mineral waters. This habit is responsible for much of the distressing spastic constipation that exists and its accompanying neurasthenia. The advertisement and sale to the laity of such a nostrum as Sal Hepatica can only increase these evil results and the physician who abets the evil by using the preparation should reflect whether he is thereby not only encouraging a fraud on the public but also what is even worse, helping to impair the public health. (*J.A.M.A.*, Feb. 7, 1914; also "Propaganda for Reform-I," p. 182.)

The evil pointed out two decades ago is even more evident today, particularly with the advent of the radio and the added evils it has brought into the advertising of the nostrum. Dentists can discourage the furtherance of the cathartic habit by refusing to distribute the clinical samples supplied to him so liberally and by prescribing a laxative or cathartic only when it is really indicated.

When the dentist feels that the use of a saline laxative or cathartic is desirable, there are a large number of official products available for this purpose. There are magnesium sulphate, sodium sulphate, citrate of magnesia solution, seidlitz powders and others which need not be detailed here. If he desires to prescribe an effervescent Glauber's salt, there is effervescent artificial Carlsbad salt, described in the National Formulary. Concluding a concise discussion of the salines and effervescent salines available for purging, Fantus ("Useful Cathartics," Chicago: American Medical Association Press, Ed. 2, 1927, p. 87) writes:

> In view of this abundance of satisfactory administration forms for salines, what justification is there for prescribing fancy-named products, whose only merit lies in clever advertising? An example of the result of thoughtless recommendations of nostrums by physicians is "Sal Hepatica."

Cathartics have their place, but it must be remembered that the cathartic must be fitted

to the condition of the individual patient. Excesses in the use of these drugs are bound with immeasurable harm for cathartics are not only in a sense habit-forming drugs, but also, as in certain cases of intestinal obstruction, they may even kill the patient. The routine use of cathartics has no place in dentistry.

It was mentioned above that Sal Hepatica was the subject of unfavorable reports by the American Medical Association in 1914 and 1921. The results of the A.M.A. Chemical Laboratory examination and the recent examination in the A.D.A. Bureau of Chemistry follow:

	A.M.A.	*A.D.A.*†
Sodium phosphate, anhydrous	4.36	3.86
Sodium sulphate, anhydrous	26.48	24.86
Sodium chloride	8.86	8.23
Carbon dioxide	9.42*	13.95‡
Total sodium	23.30	22.26
Tartaric acid, total	30.55	29.23

Thus, it is apparent that the Sal Hepatica of 1934 is essentially the same as that sold in 1921. The A.M.A. concluded that Sal Hepatica, therefore, is essentially an effervescing mixture of dried sodium sulphate (Glauber's salt) and sodium tartrate with a little dried sodium phosphate and table salt added. It is similar to the effervescent artificial Carlsbad salt described in the National Formulary official at that date.

In view of the foregoing, Sal Hepatica is declared unacceptable for Accepted Dental Remedies; because a statement of composition does not appear on the label (Rule 1); it is advertised to the public for indefinite conditions where its use may be harmful (Rule 3 & 4); it is advertised to dentists with extravagant therapeutic claims (Rule 6), and the name Sal Hepatica, indicating liver salts, is therapeutically suggestive (Rule 8).

†A.M.A. analytic methods followed.

*As calculated from analytic figures.

‡The difference may be accounted for on the basis of less interaction of the bicarbonate and tartaric acid.

Pharmaceutical Preparations and Mixtures.—These, with rare exceptions, are not original in composition and they should not be endowed with uninforming names. It is important that they be so named as to remind the prescriber and user constantly of their potent or important ingredients. When in the rare exception a pharmaceutical preparation or mixture is accepted with a coined name on the ground of originality because it presents a distinct improvement over available preparations, only the first preparation of this kind which is placed on the market shall be recognized under a coined name (which, however, must clearly indicate the potent or important constituent of the preparation). The Council may also recognize coined names for pharmaceutical preparations or mixtures (including dentifrices) that were in actual use before the establishment of the Council and that have been used continuously since that time. Names for mixtures that were named under the reasonably justified bona fide belief that they were chemical compounds, provided such coined names indicate the potent ingredients or ingredients of the preparation, are not misleading, and do not suggest diseases, pathologic conditions, or therapeutic indications may also be recognized.—Accepted Dental Remedies.

BUREAU OF PUBLIC RELATIONS

TRADER BORN

By G. G. BELL, D.D.S., Ashland, Ky.

THE "House That Shacks Built"[1] having been erected from apparently worthless material, the labor and material being exchanged for dental service, I decided that there were many articles lying about in various homes which, if placed in the proper environment, might prove a means of paying for needed dental work, with my office as a clearing house. Having established the reputation of being a trader, an appellation that probably is not coveted by many, I determined to make these exchanges if possible, and to convert useless and antiquated old silverware, old gold and household goods into legal tender.

As I journeyed into the country from time to time, I found it impractical to accept articles of food in exchange for my services. I discovered that there was one field of exchange left open operation in which would deprive no one of the comforts of life, and, at the same time, would provide a means of exchange for dental work and not upset the economy of the household. For instance, there were available old pieces of furniture which had been built by master cabinet makers and which stood in hallways as receptacles for discarded clothing and a general accumulation of other homely discarded things. At one place, I discovered an old sideboard, its color enhanced by a century's use and the softness of its wood mellowed by time. It was now used as a catchall. The two top drawers were filled with small tools and a cobbling outfit. The three compartments beneath these drawers were stuffed with broken bits of old china: teapots without lids, cracked saucers, cups without handles; old lamps guiltless of chimneys, Betty lamps that had ceased to glow a half century or more, and candlesticks that had long since served their purpose. Bits of pewter ware and sconces too added their presence to the forgotten mass. A crippled man, to whom this accumulation had been left, was "batching" in a single room of the house, and to these things he attached no sentiment or value. It seemed as if he had never thrown anything away. As I wandered through the rest of the house, I found the closet shelves laden with bottles that had once contained some cooling lotion or heating liquid. Old fire stands and fire dogs stood beside unused fireplaces, and "flock ticks," counterpanes and quilts lay upon four-poster beds that long since had ceased to be places of repose. I suggested to the custodian of these treasures that in exchange for such of them as I might choose, I make for him a set of teeth. To this he readily agreed. The teeth were made, and with a truck, I hauled from their graveyard the antiquated furniture and other articles. They were placed in my attic, and an old cabinet maker, skilled in his

1. Bell, G. G.: House That Shacks Built, J.A.D.A., 22:149 (Jan.) 1935.

art, cleaned them up and restored them to their pristine beauty. The workman, who was deaf and dumb, for his handiwork received a new set of teeth. And while I did not restore his speech, he said more with his admiring eyes as he looked upon the rejuvenated articles than I have ever heard from the lips of any man.

I sold to a museum some of the Betty lamps, part of the glassware and part of the china. For myself I kept the sideboard, the candlesticks and the sconces. It is a pleasure when I contemplate that I have brought to life fine old articles that probably otherwise would have been destroyed or taken into homes whose owners could not appreciate the value and beauty of them.

I wandered into another home, and

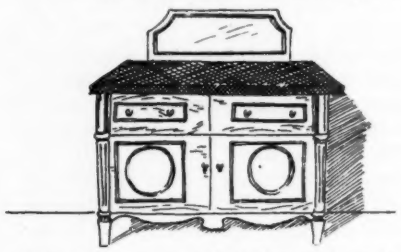


Fig. 1.—". . . an old sideboard, its color enhanced by a century's use and the softness of its wood mellowed by time."

there I found a beautiful secretary and the owners, husband and wife, in need of artificial teeth. This secretary was an imposing piece of furniture, a thing of rare beauty. It was made of mahogany and the top had two doors with shelves for books. The middle section had a lid which, when let down, served as a writing surface. Within the small compartments, four volumes of the history of Virginia were disclosed. On attempting to remove them to scan their pages, I found they were only make-believe books receptacles for papers. On either side of these were arched pigeon-holes, below which were two drawers for quills and penknives. In one of the drawers was a secret place for gold, but that gold had long since been taken out and the only treasure remaining was the exquisite workmanship. On folding up the lid of the secretary, I opened the bottom section, which had two panel doors. Within was a very peculiar arrangement of shelves and an ingenious bracket on either side in which a candle could be placed. The long silenced voice of the maker urged me to take it away from its unfitting habitat. And my own inner voice sug-

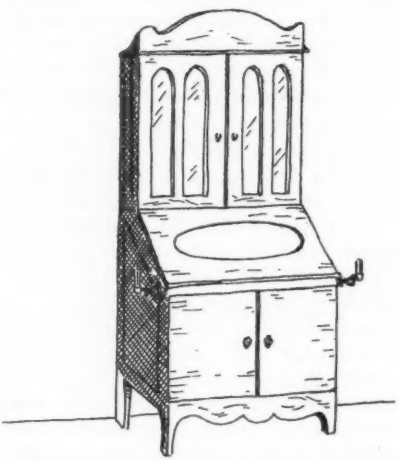


Fig. 2.—"This secretary was an imposing piece of furniture, a thing of rare beauty."

gested that, in return for it, I might make teeth for the present owners. After much bickering and trading I finally persuaded the old couple to part with the treasure, and I still feel that the teeth have done them more good than the presence of the secretary. I moved it to a spare room back of my office, where an old negro cleaned it up for me. This old fellow, who had served in the homes of the rich and who had put households in order before the days of abolition, took no un-

certain pride in bringing the "master's" secretary back to its youthful beauty. But having been taken away from the home it so long knew, the secretary was seized with the wanderlust. Before it was comfortably ensconced in my office, a man from the Blue Grass came in to see me on a matter of business. The moment he spied the rejuvenated piece of furniture, he exclaimed in his rich Southern accent, "Doctor! What will you take for it? That's my secretary and I'm going to have it!"

Now since it really was too tall and much too massive for my residence or office, what should I do but sell it to its new and ardent admirer? He would not wait until another visit to close the deal. Immediately, he called a furniture packer, and, the next day, the secretary was on its way to its new home in the "level land." The last time I saw it, the top was filled with rare old volumes; the pigeon holes were stuffed with love letters yellowed with age, and the make-believe volumes "History of Virginia" were filled with legal documents; while the shelves in the bottom compartment contained, in careful repose, the uniform of a Confederate soldier, painstakingly sprinkled with tobacco to keep moth and other insect away. Profit? Yes, a goodly sum for all my trouble; new friends made whose value could not be reckoned in dollars and cents, and a place to visit that I will always cherish in my heart, a genuine Southern mansion filled with antique furniture. Even to write about it almost impels me to drop my "r's."

In years gone by, when the hand of plenty so generously helped him and made him mindful of all that was good and pretty, an old doctor who lived in our city accumulated a vast amount of silverware: teapots, water pitchers, sugar bowls, spoon holders, cream pitchers, salt and pepper receptacles, table cutlery and flat ware. He passed to his reward, and depression came upon his two survivors, who found themselves with more than ample silver service, but wofully lacking in food to serve upon it. The two were

Fig. 3.—". . . had served in the homes of the rich . . ."

in need of dental care. I proposed to them that I furnish them dentures at my usual fee in exchange for the silverware and that I sell it and give them the difference between the amount it brought and my fee. I made them a substantial advancement, knowing that the value of their silver was far in excess of my bill. On my first trip to Louisville thereafter, to attend a conference of dentists, I took the material with me. It is a matter of some amusement, as I picture myself looking more like a pack peddler than professional man, wending my way to the train. Why the railroad company did not charge me for excess baggage for the stuff I loaded on the train is still a matter of conjecture. Arriving in the city, I did not have the courage to walk up the street carrying my cumbersome burden, so I hailed a cab, lumbered into it with my clattering pack and was whisked away to the silversmith's. The smith, who bought old silverware and who had a fine collection on display, received me with some misgivings. Now there is a sixth sense attached to a trader who is about to deal with a prospective buyer, and I took advantage of that sense and let him make an offer. The value he placed on my collection gave me the feeling of riding up in an express elevator. And for fear that he might detect from my expression that he had placed the figure unnecessarily high, I burst into a fit of coughing to restore the color which I felt had suddenly drained from my face at his amazing price. I bargained with him, and not only did I receive a check, but in addition some charming patterns of modern silverware.

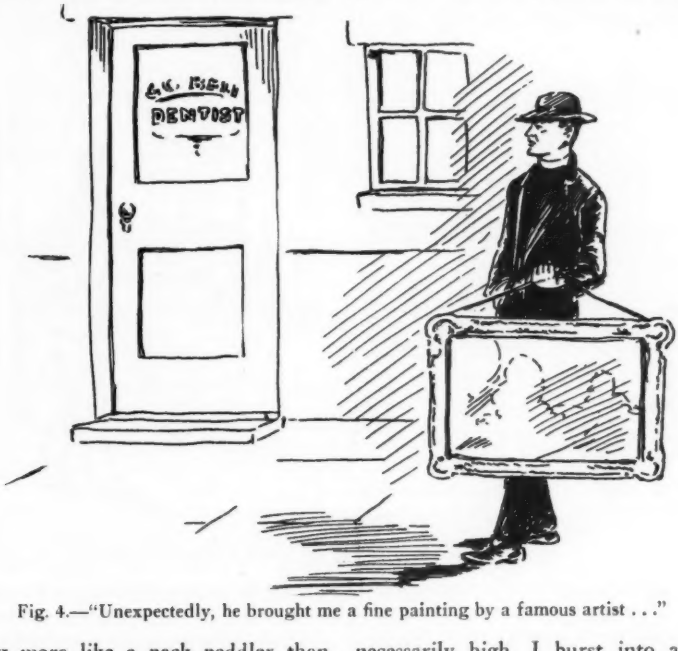


Fig. 4.—"Unexpectedly, he brought me a fine painting by a famous artist . . ."

On my return home—but wait, before returning I replenished by wardrobe. Hat, gloves, shoes and suit had begun to

look threadbare, so I arrayed myself in new apparel from head to foot. It gave me a look of prosperity, a feeling of buoyancy; both of which are far too important to one's well-being ever to be overlooked.

As to the former owners of the silverware, they too shared in the bargain. Bills long overdue were paid, an abundant order of groceries that had been a stranger in their household for many months now found its way to their larder. Their faces assumed the luster of burnished silver. From a heap of useless cutlery and tableware, food and raiment were produced, and I felt that the exchange gave two poor souls a new lease on life.

Feeling that my spiritual as well as my financial welfare needed bolstering, I paid a visit to an old minister whom I had known in my infancy and found that the depression had laid a heavy hand on his shoulder. He had been too generous in the days of his prosperity with his time and talents and had failed to lay up a store of worldly goods with his abundance of spiritual goodness. He was almost edentulous, and as we talked, commercialism being far removed from my mind, I determined to offer to restore his dentition. I asked him if he would accept from me this service if I would take the time to visit him in the parish house, remove his few remaining teeth and make a set of artificial ones. His reply was, "I am not a beggar. I have nothing to give you." "Oh yes, you have," I replied. "The advice and comfort that you have already given me on this and former visits will well repay me for the trivial amount that the material will cost. I ask but one thing. If you make a will, leave to me your glasses, and if I survive you, I shall wear them that I may see the beauty of the world and life as you have seen it." To this he agreed. Whether or not he took my request seriously, I cannot say. I removed his teeth, but four in number, as I recall, and, later on, made him dentures. I went to hear him to learn whether his enunciation was natural. He did not know that I was in his congregation. The smile that I was familiar with in the days of my boyhood was restored—the voice was young again. I felt that I had done well with my handiwork. Unexpectedly, he brought me a fine painting by a famous artist and spent a good part of one morning in pointing out to me its beauties. The painting now adorns the wall of my living room. Money could not buy it. As to the glasses—that is another story.

In our country, the foothills of Kentucky, it is customary to call elderly people "aunt" or "uncle." There was a ward of the county whose name was "Uncle John" and whose wife was "Aunt Katie." They lived 25 miles from town and I had frequently met them on hunting excursions. Uncle John was blind, but so acute was his hearing that there was something about my car which he could recognize. My voice he always knew. I stopped one day, and he told me, addressing me by name, that his wife had tic douloureux, and asked me if I could relieve her. On being answered in the affirmative, he said "You know I am a pauper and receive a small allowance quarterly from the county. The county doctor seems to be unable to help my wife. Will you come some time and give her your treatment?" "I will," I replied, and on the following Sunday I made an alcoholic injection. I saw Aunt Katie sometime later. She had obtained relief, and Uncle John informed me that he was going to pay me in walnuts. With his most willing hands, he not only gathered but also cleaned two bushels of walnuts and had a huckster deliver them to my office. They seemed to be the choice nuts of the tree, and they were so thoroughly clean that the most delicate hands would not have been soiled in handling them.

This I consider the largest fee that I ever collected. The infinite patience with which those poor horny hands had labored to produce this gift would put to shame the attitude of those people who make no effort to pay for dental service.

Exchange and barter—trade and offer to trade—so numerous have they been and I have accepted many. Some, of course, I have had to refuse altogether. One outstanding one, through superstition alone, I believe, I turned down. A man who was a cabinet maker and who at various times made coffins told me that he was in need of artificial teeth—that he had a goodly supply of well seasoned walnut and wild cherry wood; that he had not lost the nimbleness of his fingers nor his ability to fashion fine cabinet work and in exchange for teeth he would build me a coffin!

I have gathered everything in the world in exchange for my services. Firearms of early Kentucky, some of which I sent to museums and therefrom received sufficient to pay me for my work. One fouling piece I gave to an exodontist in Louisville in exchange for some courtesy that he had extended to me in helping me out on some difficult case. One particularly fine muzzle loading shotgun that was etched and engraved and inlaid with gold and silver is now the property of one of the wealthiest men in the United States. By the merest accident, he found that I possessed it, and, through his secretary, made me an offer which I could not decline.

Rare old pieces of silver have come to me which their owners gave over for much needed dental work. Some I have kept; others have been sold, and some have been given away. Handsome old gold watches whose cases were of solid gold have been received. Some went to the melting pot. One in particular was sold to a lawyer who probably had read some of Dickens and had gone into character and wanted to carry a repeater. This was a handsome piece weighing a little over 3 ounces. When a little projection was touched, it would strike the time. It had long lain among other pieces of discarded jewelry in a home that had once known prosperity but had fallen into the category of many other such residences. I took it gladly, and disposed of it rather unwillingly, but I made a good bargain. Purposely, I have gone into the court to see this man handle his watch. No fond parent ever caressed the head of a dear child more tenderly than this man caresses his watch when he aims to impress a jury or a judge.

Old cameos, old bracelets, old necklaces and old breastpins have all left their places of hiding and come into my hands. Some of them now adorn the necks and arms of relatives and some of them have been reduced to virgin gold. Odd things have been mine for services rendered. A sufferer from tic douloureux who lived in an adjoining county came to me to have an alcohol injection. "I cannot pay you. I have brought all that I have. To you, it may not be much, but to me it represents hours of labor." It was a box about 1 foot square filled with Indian tomahawks, arrowheads and artefacts. Through a love to relieve, I gave him an injection and stopped his pain. Through a love to give, I gave the treasures to my nephew. I hope I have not started him on the road to collecting.

Odd bits of glass, odd bits of china, pewter ware and wedgewood have been mine for a few hours' work. Oil paintings and plated ware have been used in lieu of coin. Fine chests of drawers and odd tables have come into my household to replace things of modern craft. I have not made a junk shop of my office or home. I have moved the pieces out as gracefully as I moved them in when they did not serve some use. Museums, state

collections, universities and historical societies have profited by my trading. I have learned that to keep busy is one of the blessings of life, and, in addition to doing this collecting and trading, I have placed the mouths of 100 or more indigent children in order that they might attend school in comfort to themselves and their companions. I feel that I should take a rest from this activity, but to stop it is as hard as it was to begin it. Scarcely a day passes but some one comes in for some trade with an article that has more or less value. This activity has certainly been a means of education as well as a means of lightening the load of worry that would naturally fall upon one who does not keep his time occupied.

DENTISTRY IN A STATE HEALTH DEPARTMENT*

By RICHARD C. LEONARD, D.D.S., Baltimore, Md.

THE very fact that this period is given over to the discussion of public health dentistry is witness to the awakening interest on the part of the profession in the general trend toward the broad application of dental health knowledge to the public as a whole rather than to select clienteles only. There is greater interest in state dentistry, panel dentistry, etc., than ever before. What is the rôle of state departments of health in these and kindred subjects? This paper is my conception of the answer. It will try to tell what a state—any state's—health department may do in the way of dental health activities.

The function of a state health department is the promotion of the health of its citizens and the prevention of disease. This is accomplished or attempted in sundry ways too numerous to mention in detail. Suffice it to say that its major activity is to educate lay people in ways making for their health without (and this is most important) engaging in the actual practice of any of the healing arts. In other words, a health department is intended to be an agency concerned with the health interests of lay groups; i.e., preventing disease and eliminating sources of disease, particularly those which lead to epidemics. But while control of disease, once it occurs, is attempted, the actual practice of medicine is, or should be, assiduously avoided.

Public health dentistry to a large extent recognizes these limitations. The possible inclusion of corrective practice as a part of any health department's dental activities is justifiable only by virtue of the clinical work serving as an educational demonstration and because the very prevalence of caries makes it, at times and in certain places, advisable to resort to practicality rather than to devote all effort toward purely didactic education. This will be discussed in more detail later.

On the premise then that public health dentistry is an educational activity, there remains only the problem of who shall be instructed, how instruction shall be given and what shall be taught. Obviously, the real goal is lay education. The means to this end may, for the want of better terminology, be described as indirect and direct.

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Seventy-Sixth Annual Session of the American Dental Association, St. Paul, Minn., Aug. 7, 1934.

Indirection implies the insertion of an intermediary who, instructed first, imparts the knowledge so gained to the laity. Such intermediate agents are probably innumerable, but there are two such that warrant especial mention:

First, the dentist. Changes in the relation between the dentist and his clientele are admitted. World-wide economic changes promise even greater differences in this relationship. As never before, it is now realized that dentistry has a duty to public health in general, is no longer limited in that duty to the persons who may be a part of a clientele. So it is no indictment of the dental profession nor of the dental schools to say that the dentist is the first of these intermediaries that must be educated in new ideas about his relations with the public.

This new training should merely augment the present excellent dental school curriculums by including in them courses in social economics, public dental health and, particularly important, the latest developments of science dealing with preventive dentistry. The dental graduate of tomorrow must be armed with this sort of training if he is to play his part either as a qualified purveyor of dentistry to an individualistic clientele or as a contributor to a generalized public dental health project.

So much for the coming graduates. The practitioner of today offers more difficulty in his equally important training. It is not so much a matter of the difficulty of "teaching old dogs new tricks" as of creating the opportunity to train them. Postgraduate courses in dental schools will partially solve the problem. Papers and clinics at meetings of organized dentistry are the only other means of reaching the practitioner and these are the means by which they must be reached. If dental societies are approached with the idea of inclusion on their programs of papers and clinics, competently prepared and interest-attracting, on the various phases of public health and preventive dentistry, they will welcome the opportunity. Every opportunity so afforded will result in additions to the ranks of general practitioners who are interested in public health. Every recruit so enlisted may be depended on to serve as a disseminator of knowledge to our ultimate consumers—the laity.

The second group considered as worthwhile intermediaries for dental health training is composed of public school teachers. Without fear of contradiction, it may be stated that the average dentist is not a teacher. Teaching is an art and science. To get our message of mouth health to the lay public, it is essential that persons trained in the art and science of pedagogy be employed. But first they must be properly acquainted with the subject to be taught.

Too long has oral hygiene been the stepchild of medically written general hygiene textbooks and lectures. It is time that competent instruction in the subject be placed in the hands of the dental profession. A good start in this direction is the inclusion of oral hygiene lectures by a dentist in normal schools or teachers' colleges. In these institutions, young people are trained to teach our children. Why should not the opportunity be created to include in their training knowledge of the ways and means of maintaining mouth health?

A few years ago, at an A.D.A. meeting, Walter T. McFall, in discussion of a paper, was stressing ways and means that made for school dental clinic success. I remember his statement apropos of the necessity of the teacher's cooperation, "You must play up to the ladies." I agreed then as I do now. And I feel that the only qualification necessary to make his statement equally applicable

to our problem of lay education is to start the "playing up" through a bona fide course in things dental when "the ladies" —and the young gentlemen—are receiving the basic training that is to fit them as teachers. I earnestly believe that when our normal school and teacher training graduates leave their schools properly trained in the importance of and the simpler ways of maintaining mouth health, a long, long stride will have been taken toward the age when our professional knowledge of the value of dental care will be general lay knowledge.

So much for the indirect approach to lay education. The direct method may also be divided into two phases; namely, didactic and clinical, or demonstrable. The former includes all devices employed in education. Lectures before lay groups, talks on the radio, distribution of pamphlets and posters and health movies, all these may be utilized in calling attention to the importance of mouth health and dental care.

Time will not permit a detailed discussion as to how a dental director uses these various means of reaching his lay audience; but one or two facts concerning them are worthy of emphasis as they influence the success attained.

First and possibly foremost is simplicity of expression in the written or spoken word. In addressing a lay audience, it must be kept in mind constantly that one's hearers are, in all likelihood, wholly unacquainted with what may be the simplest of professional terminology. And the inclusion of such terms may, possibly, cause a mental groping that will result in loss of the thought that one is trying to present. This is not merely true of a juvenile audience: most adults are juvenile in their conception of technical terms.

Along with simplicity of terms is the necessity for basing one's statements on facts, not fads. There is no place in this educational program for the promulgation of fancied panaceas. There are enough facts regarding the parts played by the various factors of nutrition, cleanliness and dental care, to permit the imparting of well-rounded information. Let us argue the relative merits of these factors, but avoid the confusing of lay minds with pro and con arguments.

Finally, I wish to touch on the question of the clinic as a part of a health department's dental health program. Some decry such activity as smacking of state dentistry, of trespassing on the rights of practitioners, such as an unequitable use of tax money; while proponents talk of the rights of children to mouth health and of health maintenance being as important as mental development and hence a function of the public schools.

It is not in support of the arguments of these proponents nor in antagonism to objectors that health departments support the idea of school dental clinics as a part of their programs. Health departments are not social service agencies, or at least but indirectly. They are educationists in health; and health department clinic programs are justifiable only as they serve as an educational factor—a demonstration —of the value of mouth care. If they afford dental relief as a by-product to children of indigent and low-wage families, well and good. But if they give this relief without its serving as an educational demonstration, they fail in their prime purpose.

Trite though it may be, the saying "Seeing is believing" is applicable to the value of corrective dental clinics. Dental clinics offer mouth health education freed of theory and reduced to practicality. It is visual education with the added advantage of being demonstrated through the most universally appealing thing in the world—a child.

Limiting school dental clinic work to

an early age group (in Maryland, it is usually limited to the children of the first three grades) not only offers the best material for a display of the value of dental care, but also minimizes trespassing into private practice to such an extent that few, if any, practitioners are unwilling to concede moral support to the project. Briefly, the plan is as follows:

First, every dentist in the community is visited and his consent to the plan is requested. This consent has been given in every case, usually wholeheartedly, and never grudgingly. The plan includes the appointment of a dental clinician, employed full time, who devotes his efforts to the examination and, on signed parental request, corrective dental treatment of the children of the first three elementary school grades and preschool children. This limitation is strictly adhered to.

Whether or not parents are advised of the need of dental attention depends on examination findings. Notices are sent to all parents of children needing dental treatment. All are urged to take the child to a private practitioner, but all are accorded an opportunity to receive dental clinic care.

This plan of making the clinic available to all children of the limited age group rather than trying to limit corrective work to those unable to afford private dental service is based on the unsuccessful administration of the latter plan. To classify children according to the financial status of their families requires social service that is not available in many localities. Failure to classify them properly creates more antagonism on the part of local dentists than does the plan of limiting clinic care eligibility to a low age group, urging care by private practitioners for all and treating any or all that request it.

The clinic finances are derived from three sources; namely, a state grant, a local grant (usually from the board of education or county commissioners) and from fees collected from children. The last named are sometimes inconsequential, but serve the dual purpose of aiding in financing the clinic and in inculcating the idea that the service rendered is of value.

The scope of the clinic depends, of course, on its finances. When they are exhausted in one community or county, a move elsewhere is arranged. The service is limited to the simpler types of dental work: alloy and cement fillings, extractions and prophylactic care. At the risk of sidetracking the contention that the clinic work is primarily educational, it may be stated that in Maryland counties in 1933, 19,068 children were examined and 9,408 treated, and 39,729 dental operations performed. Since most of this work was on children who otherwise would not have had it, there is no little pleasure to be gained from the thought of their betterment.

But the clinic is not merely a laboratory turning out dental corrections. Every patient learns something of the importance of mouth health. Parents are invited to consult with the clinician. Talks are given before the children and their parents. We find that the teachers too accept the clinic as a demonstration of the value of dental care.

This school dental clinic plan does not begin to answer the sociologic problem already mentioned as facing our profession. It is not intended to do so. But it is felt that it does have some attributes that may well be copied in any ultimate solution of that problem. These are (1) lay education as a prime motive; (2) control of the project by members of the dental profession, and (3) constant vigil in safeguarding the interests of the profession which has the interest of the public at heart.

In the beginning of this paper, reference was made to the newly awakened interest of the profession in tendencies toward socialization of dentistry. This interest is welcomed by those of us who are engaged in public health work. We believe that we are passing through a period of transition in regard to the attitude of the profession toward our projects. To the economic depression may be ascribed at least some good. It has changed the apathetic, or at least placid, acceptance by the profession of dental health education into widespread, sometimes belligerent and nearly always intelligent interest in what we are doing.

Dentistry is now being recognized as a logical part of any public health activity by a large part of the profession. They realize that if dental health education was worthwhile in those golden days prior to 1929, the present change in economic conditions makes it imperative. Those that decry our activities have, we believe, carefully considered neither the seemingly unavoidable trend toward socialization nor the difference between public health educational programs and those other truly socialized projects such as panel dentistry and state dentistry. The opportunity to point out these differences is a welcome one.

Definite prophecy as to the possibility of socialization of dentistry has no place in this paper. But certainly it may be remarked that if it comes, as many think it must, the present-day state health department programs may be, in their work of lay education, pointing the way to a correct solution of how socialization may be effected with the resulting greatest good to the public and a minimum of trespassing on the prerogatives of the profession.

NEW DENTAL SCHOOL IN PORT-AU-PRINCE, HAITI, AND ITS WORK

By S. A. DANIEL, D.D.S., Port-au-Prince, Haiti

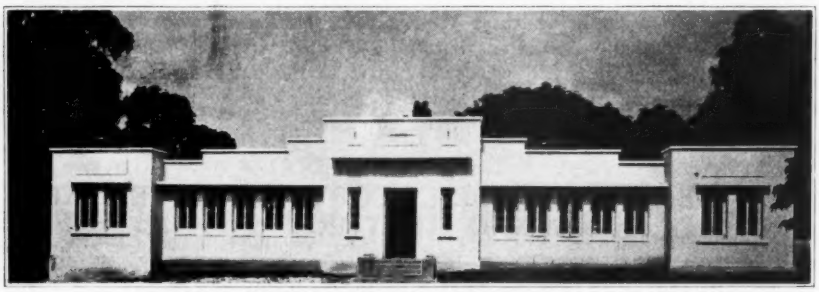
THE plan so long cherished by the staff of the Dental Department at the Medical School of Haiti has at last materialized and the new dental school has been completed and turned over to the dental department.

In a brief report covering the organization of the new dental school, which was published in the *Oral Hygiene* in 1931, I expressed the hope that some generous person would come to our aid in helping to erect an infirmary where we might continue our work. The most optimistic of our staff never expected to realize in so short a space of time, and without any help but that of our generous government of Haiti, a new building, large, commodious and properly equipped for educational activities and the public benefit.

Twenty years ago, in this country, we had but one class of patients who received professional benefits, the socially well-to-do. The others were the hospital patients who received but the most elementary kind of surgical attention. Today, with the new dental school, we have established a condition which is met only in large centers, where prevention and treatment of dental disease of school children become an integral part in the problem of general hygiene.

Besides the facilities for the training of young men for the degree of dental surgery, the dental school has recognized the necessity of also preparing hygienists for the heavy task of bettering the health of our country people, so sadly in need of receiving dental services. This work of pushing dental sciences to the very depths of our mountain country is staggering to those who know not how we manage to do so much with almost nothing. Our rural service does not consist alone in taking in the districts near our capital. Far from this, it extends to different cities of Port de Paix, Jacmel and farther into the interior, to Hinche and Cerca la Source.

Dental students attend lectures at the medical school, where all courses in pathology, bacteriology, biology, chemistry, etc., are given. The admission number is limited to four each year. The men are obliged to have a bachelor's degree. Selection is made by elimination through competition of the candidates.

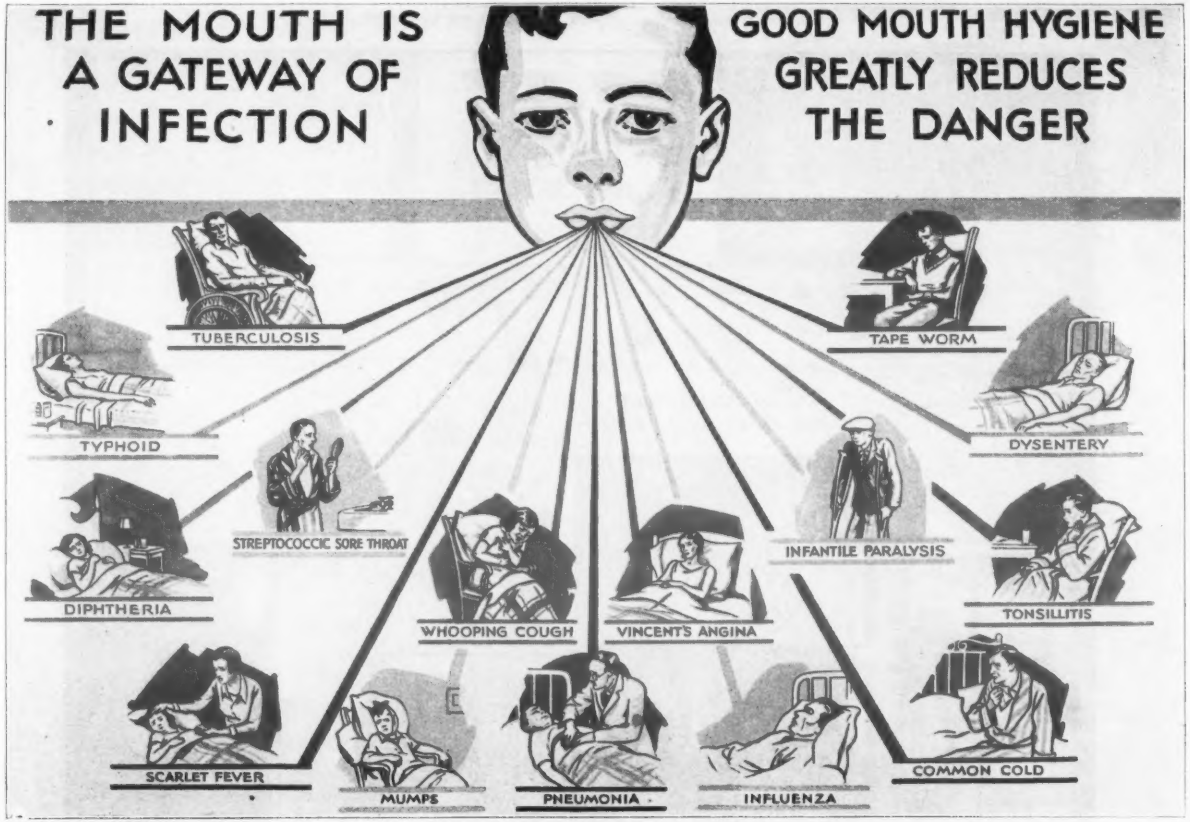


New dental school, Port-au-Prince.

The rural dentist attends all patients, school children and men in the outskirts, diagnoses and outlines the treatment, then returns to the locality to undertake the job of relieving pain for those who have never heard of dentistry. The children examined are of the ages of 3 to 15 years. We have found 8 to 9 cavities per mouth in these children. The undertaking is difficult. Without any financial aid other than that from our government, we are carrying aid to the mass of the population. The quality of work done varies greatly, for the most part consisting of extractions. School children receive special treatment, such as fillings.

I am sure that our work will attain great success in the near future. The problem which faces our department is knowing how to meet the pressing needs in pushing our experimental scheme. The service planned means more to the health of the country than it is possible to comprehend.

GOOD MOUTH HYGIENE
THE MOUTH IS



University of Illinois.

May Day—Child Health Day—A message more powerful than words.

GOOD FOODS BUILD GOOD TEETH
THE PARADE OF GOOD TEETH BUILDERS
DO NOT NEGLECT YOUR TEETH
DENTIST
SEE YOUR DENTIST WITHOUT DELAY
"We'll fix matters."
EVEN MICKEY AND MINNIE BRUSH THEIR TEETH
EVEN MICKEY AND MINNIE BRUSH THEIR TEETH EVERY DAY
WE OBSERVE GOOD TEETH RULES
PROTECT TEETH WITH DENTAL CARE AND PROPER DIET

Fig. 1.—Winning posters in dental health contest.

DENTAL HEALTH POSTER CONTEST

By MRS. W. A. DVORAK*

DURING the past year, the Minnesota State Dental Auxiliary sponsored a state-wide dental health poster contest among the school children. The project was begun late in the school year, but despite this, approximately 750 children from thirty-four communities participated. Each of the seven districts in the state took part, and after local and district elimination contests, each district finally submitted ten posters, making a total of seventy from the entire state.

Fig. 2.—Button presented contestants.

These were exhibited and judged at the state dental convention in February. There were no restrictions as to the type of poster submitted, but the impressiveness of some dental health message was mandatory and paramount. All posters were exceptionally fine, revealing much effort and dental health thought. Because of the variety of important dental health messages, unique slogans and uniformly high caliber of posters, the judges found it difficult to reach a satisfactory agreement, and therefore a popular vote by the dentists attending the state convention was resorted to. The picture here illustrates the twelve prize winning posters. The auxiliary awarded eight loving cups to the schools, represented by the winners of the first and second prizes in each class. Practical school gifts constituted the third prizes. In the districts, cash awards were made to the pupils winning prizes. The president of the state dental association sent a letter of congratulation to each of the state prize winners, while the president of the state dental auxiliary, Mrs. G. B. Steadman, enclosed a personal letter with a pamphlet "Dentistry and Public Health" and a button with the inscription "Dental Health Crusader," for every child who participated in the contest.

Fig. 3.—Bernice Maple, winner of trophy in poster contest.

Some very interesting facts were brought out by the contest. Briefly, the majority illustrated toothpaste; most posters were made by girls; the children in junior high schools were most interested and submitted the largest number of posters. Health workers and school authorities cooperated wholeheartedly, and are eager to continue the project. The contest radiated interest in the

*Chairman, Minnesota State Auxiliary Oral Hygiene Committee.

Fig. 1.—Winning posters in dental health contest.

schools that the participants attended, but the local displays and the publicity in the local newspapers carried the message to various homes and communities. Since the awards have been given, it has been most gratifying to see the responses which interested organizations have made to "honor" the prize winners.

In the Whittier School in St. Paul, the winner of a trophy was invited to attend the P.T.A. meeting, and display her poster and trophy. The president told the group that Marjorie Rogers, the winner, was a superior student in her grade, assistant editor of the school paper and a vice president of the Y.W.C.A. Followers. She was lauded for having brought the "first loving cup" to their school. The parents were most enthusiastic and eagerly shouted "speech, speech." The following day her picture with the trophy and poster appeared in the *St. Paul Pioneer Press.*

In the Minneapolis District, the winner of a trophy, was little Miss Bernice Maple, 13 years old. Bernice has been ill most of her life, and had spent one year in a sanitarium, where she was treated for tuberculosis of the bone. For years, she was unable to use her arms, hands or feet. Some time later, she was admitted to the Shriners' Hospital for Crippled Children, where she spent many months receiving treatment for arthritis. Now Bernice has so much improved that she is again back in her own little rural home, and, although still under the supervision of the hospital, she attends the school in her own community. Her poster took much thought and a great deal of effort, for her hands still do not function as adeptly as those of a normal child. In spite of her handicaps, she produced the poster, which brought a trophy to her school. Because of her achievement, the Big Brothers and Big Sisters of the Shrine in Minneapolis invited Bernice and her mother and the officers of the dental auxiliary to their monthly luncheon, where Bernice was the guest of honor, and displayed her poster and trophy. She is also to be feted by their local P.T.A. Association.

DENTAL ECONOMICS

COURT UPHOLDS LAW AGAINST DENTISTS' ADS

An Oregon law prohibiting dentists from advertising was upheld today by the Supreme court.

Harry Semler, a Portland dentist, contended the 1933 act was not for the welfare of the general public, but for the financial benefit of a part of the dental profession at the expense of the public.

Chief Justice Hughes, who delivered the opinion, said that the important point was whether the Oregon law was an "arbitrary interference with liberty and property," adding that the public should be protected against practices which "tend to demoralize the profession."—*Chicago Daily Tribune,* April 2, 1935.

A copy of the U. S. Supreme Court decision follows:

SUPREME COURT OF THE UNITED STATES

No. 538.—October Term, 1934.

Harry Semler, Appellant,
vs.
Oregon State Board of Dental Examiners, L. A. Rosenthal, Leonard R. Andrews, et al., etc.
} Appeal from the Supreme Court of the State of Oregon.

[April 1, 1935.]

Mr. Chief Justice Hughes delivered the opinion of the Court.

This case presents the question of the validity of a statute of the State of Oregon, enacted in 1933, relating to the conduct of dentists. Oregon Laws, 1933, Chapter 166. Previous legislation had provided for the revocation of licenses for unprofessional conduct, which, as then defined, included advertising of an untruthful and misleading nature. The Act of 1933 amended the definition so as to provide the following additional grounds for revocation:

"advertising professional superiority or the performance of professional services in a superior manner; advertising prices for professional service; advertising by means of large display, glaring light signs, or containing as a part thereof the representation of a tooth, teeth, bridge work or any portion of the human head; employing or making use of advertising solicitors or free publicity press agents; or advertising any free dental work, or free examination; or advertising to guarantee any dental service, or to perform any dental operation painlessly."

Plaintiff, a dentist practicing in Portland, Oregon, brought this suit in the state court against the members of the State Board of Dental Examiners to enjoin the enforcement of the statute, alleging that it was repugnant to the due process and equal protection clauses of the Fourteenth Amendment, and impaired the obligation of contracts in violation of Section 10, Article I, of the Constitution of the United States. The circuit court, overruling this contention, sustained a demurrer to the complaint and, upon the refusal of plaintiff to plead further, the suit was dismissed. On appeal, the Supreme Court of the State took the same view of the federal question and affirmed the judgment. 34 Pac. (2) 311. The case comes here on appeal.

Plaintiff alleged in his complaint that he was licensed in 1918; that he had continuously advertised his practice in newspapers and periodicals, and by means of signs of the sort described in the amended statute, and that he had employed advertising solicitors; that in his advertisements he had represented that he had a high degree of efficiency and was able to perform his professional services in a superior manner; that he had stated the prices he would charge, had offered examinations of prospective patients without charge, and had also represented that he guaranteed all his dental work and that his dental operations were performed painlessly. He further alleged that the statements in his advertisements were truthful and were made in good faith; that by these methods he had developed a large and lucrative practice; that through long training and experience he had acquired ability superior to that of the great majority of practicing dentists; that he had been able to standardize office operations, to purchase supplies in large quantities and at relatively low prices, and thus to establish a uniform schedule of charges for the majority of operations; also that he had made contracts for display signs and for advertisements in newspapers, and had entered into other engagements, of which he would be unable to take advantage if the legislation in question were sustained, and, in that event, his business would be destroyed or materially impaired.

Plaintiff is not entitled to complain of interference with the contracts he describes, if the regulation of his conduct as a dentist is not an unreasonable exercise of the protective power of the State. His contracts were necessarily subject to that authority. *Rast* v. *Van Deman & Lewis,* 240 U. S. 342, 363; *Union Dry Goods Co.* v. *Georgia Public Service Commission,* 248 U. S. 372, 375, 376; *Sproles* v. *Binford,* 286 U. S. 374, 391; *Stephenson* v. *Binford,* 287 U. S. 251, 276. Nor has plaintiff any ground for objection because the particular regulation is limited to dentists and is not extended to other professional classes. The State was not bound to deal alike with all these classes, or to strike at all evils at the same time or in the same way. It could deal with the different professions according to the needs of the public in relation to each. We find no basis for the charge of an unconstitutional discrimination. *Watson* v. *Maryland,* 218 U. S. 173, 179; *Miller* v. *Wilson,* 236 U. S. 373, 384; *Missouri ex rel. Hurwitz* v. *North,* 271 U. S. 40, 43; *Dr. Bloom, Dentist, Inc.* v. *Cruise,* 288 U. S. 588.

The question is whether the challenged restrictions amount to an arbitrary interference with liberty and property and thus violate the requirement of due process of law. That the State may regulate the practice of dentistry, prescribing the qualifications that are reasonably necessary, and to that end may require licenses and establish supervision by an administrative board, is not open to dispute. *Douglas* v. *Noble,* 261 U. S. 165; *Graves* v. *Minnesota,* 272 U. S. 425, 427. The State may thus afford protection against ignorance, incapacity and imposition. *Dent* v. *West Virginia,* 129 U. S. 114, 122; *Graves* v. *Minnesota, supra.* We have held that the State may deny to corporations the right to practice, insisting upon the personal obligations of individuals (*Miller* v. *State Board of Dental Examiners,* 90 Colo. 193, 287 U. S. 563), and that it may prohibit advertising that tends to mislead the public in this respect. *Dr. Bloom, Dentist, Inc.* v. *Cruise,* 259 N. Y. 358, 363; 288 U. S. 588.

Recognizing state power as to such matters, appellant insists that the statute in question goes too far because it prohibits advertising of the described character, although it may be truthful. He contends that the superiority he advertises exists in fact, that by his methods he is able to offer low prices and to render a beneficial public service contributing to the comfort and happiness of a large number of persons.

The state court defined the policy of the statute. The court said that while, in itself, there was nothing harmful in merely advertising prices for dental work or in displaying glaring signs illustrating teeth and bridge work, it could not be doubted that practitioners who were not willing to abide by the ethics of their profession often resorted to such advertising methods "to lure the credulous and ignorant members of the public to their

offices for the purpose of fleecing them." The legislature was aiming at "bait advertising." "Inducing patronage," said the court, "by representations of 'painless dentistry,' 'professional superiority,' 'free examinations,' and 'guaranteed' dental work" was, as a general rule, "the practice of the charlatan and the quack to entice the public."

We do not doubt the authority of the State to estimate the baleful effects of such methods and to put a stop to them. The legislature was not dealing with traders in commodities, but with the vital interest of public health, and with a profession treating bodily ills and demanding different standards of conduct from those which are traditional in the competition of the market place. The community is concerned with the maintenance of professional standards which will insure not only competency in individual practitioners, but protection against those who would prey upon a public peculiarly susceptible to imposition through alluring promises of physical relief. And the community is concerned in providing safeguards not only against deception, but against practices which would tend to demoralize the profession by forcing its members into an unseemly rivalry which would enlarge the opportunities of the least scrupulous. What is generally called the "ethics" of the profession is but the consensus of expert opinion as to the necessity of such standards.

It is no answer to say, as regards appellant's claim of right to advertise his "professional superiority" or his "performance of professional services in a superior manner," that he is telling the truth. In framing its policy the legislature was not bound to provide for determinations of the relative proficiency of particular practitioners. The legislature was entitled to consider the general effects of the practices which it described, and if these effects were injurious in facilitating unwarranted and misleading claims, to counteract them by a general rule even though in particular instances there might be no actual deception or misstatement. *Booth* v. *Illinois,* 184 U. S. 425, 429; *Purity Extract Company* v. *Lynch,* 226 U. S. 192, 201; *Hebe Company* v. *Shaw,* 248 U. S. 207, 303; *Pierce Oil Corporation* v. *Hope,* 248 U. S. 498, 500; *Euclid* v. *Ambler Company,* 272 U. S. 365, 388, 389.

The judgment is affirmed.

Judgment affirmed.

A true copy.

Test:

Clerk, Supreme Court, U. S.

HEALTH INSURANCE—FOR AND AGAINST

Many articles have been written on the subject of health insurance during the past two years. Some of the arguments advanced, both those for and those against, are sincere, some are sane, some are insane and some are ridiculous. Below is a partial list culled from a score or more of articles on the subject:

ARGUMENTS FOR HEALTH INSURANCE

1. The mass of American people are receiving inadequate medical care.
2. Medical costs cannot be budgeted by individuals, but can be met when distributed over large groups.
3. Even in normal times, half the population receive no medical care whatsoever.
4. A still larger proportion of the population receive no dental care.
5. The doctor, in most instances, has to carry the load of unpaid medical service.
6. A system of health insurance would work to the advantage of both the physician and the patient.
7. Health insurance does not mean that the health workers' hands or instruments need be tied.

8. The American people pay $3,700,000,000 for all kinds of medical care and medication. That is $30 a year for each person. It is enough to provide medical care for all, if it is distributed properly, by adopting well-tried health-insurance methods.

9. The medical care for ten million American families in the $1,200-$2,000 income class falls far short of that received by those families in the $5,000-$10,000 income class.

10. In 1929, one third of all private medical practitioners had net incomes of less than $2,500, and one-half had less than $3,800.

11. All the people do not obtain the care that they really need, either qualitatively or quantitatively.

12. Costs are unevenly distributed, causing hardship to some, while others pay little or nothing. Families of moderate or low income cannot fully overcome this unevenness by budgeting.

13. The fact that incomes of practitioners are frequently uncertain, irregular and low constitutes a grave problem, with social as well as individual consequences.

14. Present methods of providing and paying for medical service are, from the social point of view, wasteful and uneconomic.

15. Health insurance directs a much larger share of the national income into medical channels.

16. It aids young physicians and dentists to get started in practice without a period of starvation.

17. It encourages the growth of preventive service.

18. It affords a vast amount of clinical material to the young practitioner.

19. Because the insured has already paid his premiums, he will be more likely to call a doctor at the onset, before his illness reaches a serious stage, increasing his chance of an early cure.

20. The patient would be able to secure hospital service without the embarrassment of seeking charity.

21. Many families who now have no family doctor would be added to the clientele of the insurance physician.

22. Health insurance would aid hospitals to meet the cost of operation.

23. It would tend to draw patients away from the outpatient department of hospitals and clinics back to the private physician and dentist, leaving the dispensaries free to care for indigent cases.

24. It would provide a better check on epidemic disease.

25. It would bring about a better distribution of doctors and hospitals by making both to exist in sections which cannot now support them.

26. It would have a tendency to eliminate quacks.

Four reasons for the superiority of compulsory insurance listed in a report of the International Labor Conference of the League of Nations:

1. In modern conditions, the protection of the worker's health is a matter of concern, not only to himself personally, but also to the community, which, therefore, should not leave him to his own resources and his own initiative.

2. Voluntary insurance seldom induces more than a comparatively small proportion of the workers to provide against the consequences of their falling ill.

3. The compulsory system is the only effectual means of protecting the working class as a whole.

4. Only an obligation of the state's members to adopt this system can give any satisfactory guarantee that the financial charges on the score of sickness insurance will be more or less equalized. (This refers to members of the League.)

ARGUMENTS AGAINST HEALTH INSURANCE

1. Health insurance as applied either in this or other countries has been unsuccessful.

2. It does not decrease the total cost of medical care.

3. The administrative cost (as indicated from a German report) almost equals the sums paid for health service. The extension of administration, its multiformity, the complication of its legal regulations, the special supervising and the maintenance of the judicial staff constantly add to the administrative costs.

4. It develops a swarm of job hunters, who threaten to form a red tape bureaucracy in a state sickness insurance system, and creates an immense load of bureaucrats for the public to support.

5. It cannot provide reasonable compensation to medical men because of the inevitable administrative costs. We cannot expect more from state administrators and their employes than they have ever been able to give in the past.

6. Compulsory regimentation immediately involves a set-up of administrative jobs which would overload the taxpayer.

7. It reduces payrolls, reduces employment and profit and increases prices.

8. Political encroachment and domination are practically unavoidable.

9. It levies a tax on all for the benefit of a selected group.

10. It fosters competition and commercial practices among organized medical groups.

11. In forty-four states, compulsory compensation insurance laws involve similar expensive administrative machinery, which is rarely satisfactory and is largely riddled with scandalous racketeering. When workmen's compensation laws cease to fetter physicians' hands and instruments, it may be the time to attempt another experiment evolved from current painful experiences.

12. Health insurance would call for endless legislation and annual amendments to existing insurance laws, as in England for the past twenty-five years and in Germany for the past fifty years.

13. The possibility of political pressure on legislators and government officials who control and distribute the funds would be enormous.

14. Health insurance does not provide care for the unemployed and indigent. These must still be treated by the practitioner at a more reduced income.

15. It will cost millions of dollars if the medical service is to be complete.

16. Health insurance is not a successful public health measure because sickness itself is not decreased in those countries in which health insurance is in effect.

17. In those countries in which health insurance has been in effect for some time, the sickness rate has actually increased.

18. In Germany, since sickness insurance has been in effect, the average number of days of incapacity to work owing to ill health has risen from five and one-half to twenty-eight, although health in general has considerably improved.

19. Health insurance has not lowered the mortality rates in those countries in which it is employed. The majority of people, even during the present depression, have received health care. Physicians, dentists and hospitals are caring for people's health needs whether they can pay or not.

20. The quality of medical service rendered under health insurance deteriorates.

21. Health insurance eliminates the principles of free choice of physician and dentist.

22. It destroys the personal relationship between patient and doctor.

23. It encourages dishonesty on the part of both the patient and the doctor. It creates a tissue of lies and deception.

24. It causes patients to exaggerate trivial complaints.

25. It causes some people to feign illness and encourages malingering.

26. It opens the practice of medicine to corruption, graft and ineffectiveness.

27. It degrades the professional man to the status of an industrial worker in a mass production factory and results in inferior medical care for the public.

28. It causes regimentation of the public: every one must pay for a physician regardless of his personal desire.

29. No scheme of social insurance in this or any country suitable for good times as well as bad has as yet been adopted.

30. "A doctor's personal interest in his patient is essential. The response he makes emotionally to the trust reposed in him is important. Every person's capacity to expand emotionally and to sustain a confidential relationship is limited. A physician may be able to maintain a keen mental activity while examining a few cases a day, but after his limit is reached, the power to sustain these faculties on a high plane wanes, until finally, when the last case of a long line is reached, the patient becomes merely a serial number on a piece of paper. Health insurance forces on the doctor an utterly impossible human task—to sustain a genuine personal interest in all the individuals of a miscellaneous crowd at his door."

31. "While the first effect of health insurance (in foreign countries) was to increase somewhat the income of physicians whose practice was largely confined to the low income group, later, in most systems, the income of physicians in insurance practice was reduced and at the same time the field for private practice had become so contracted that the total average income was lower."

32. "No matter how rosy the picture of ideal care for the poor that is presented by such schemes for health insurance, in practice they do not work. They cannot work, because they fail to take account of factors in human relations which are indispensable in the practice of the healing art."

Additional arguments pro and con can be secured from articles on file in the Library of the American Dental Association. A bibliography of these articles was published in the April, 1934, and the February, 1935, issues of THE JOURNAL.

RESOLUTION ADOPTED BY THE FIRST DISTRICT DENTAL SOCIETY OF NEW YORK, MARCH 4, 1935

WHEREAS, it is universally recognized that dental disease is commonly the cause of serious systemic disease and that therefore dentistry is an essential part of any comprehensive health program, and

WHEREAS, even in prosperous times, a large proportion of the population is economically unable to meet the costs of obtaining adequate dental service, and

WHEREAS, health insurance legislation is being studied by the Federal as well as the state governments, and

WHEREAS, dentistry, conscious of its social obligations as a progressive health service profession, must accept full responsibility for development of the dental aspects of any sound system of health service that may be proposed, be it,

Resolved, that the First District Dental Society approve in principle the current endeavors to provide adequate dental service for the low-income group of the population by a socially equitable method of distribution of the costs of such service, and be it further

Resolved, that a committee of five be appointed to study the problem intensively and report to the society within three months a model dental section that may be incorporated in any health insurance bill that may be introduced in the New York State Legislature.

RESOLUTION PASSED BY THE SECOND DISTRICT DENTAL SOCIETY OF NEW YORK

The following resolution was unanimously passed at the regular meeting of the Second District Dental Society, March 11, 1935:

WHEREAS: At the present time, there is introduced into the Legislature of the State of New York a compulsory health insurance bill known as the Epstein or Byrne Bill, and,

WHEREAS: This bill was drawn without the consent or advice of organized dentistry, organized medicine or organized pharmacy, even though it is solely dependent on these professions for its function, and,

WHEREAS: This bill is contrary to the best interest of these professions and public, and,

WHEREAS: The members of organized dentistry feel that they are the best judges for the direction of their profession; therefore be it

Resolved: That the Second District Dental Society go on record as opposed to this bill and to any similar type of legislation and be it further

Resolved: That a copy of this resolution be forwarded to the officers and members of the Executive Council of the Dental Society of the State of New York and to all district societies of the Dental Society of the State of New York, to the Kings County Medical Society, to the Professional Guild of Kings and Queens Counties, and to the Medical Society of the State of New York.

The following motion was made and carried at the regular meeting of the Second District Dental Society, March 11, 1935:

It was moved and carried that a vote of confidence be expressed to the Board of Trustees and Officers of the American Dental Association sustaining them in their efforts in behalf of the dental profession on the occasion of these trying times.—*Bull. Sec. Dist. D. Soc.*, April, 1935.

RESOLUTION ADOPTED BY THE COUNCILS OF THE CALIFORNIA AND SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATIONS

WHEREAS: The studies of the California Medical Economic Survey have shown the inability of a certain percentage of our population to adequately finance the cost entailed by dental services, and

WHEREAS: Because of this economic situation, it appears that proper dental care is beyond the reach of this population group, and

WHEREAS: It has been established that this problem can be alleviated by the utilization of the insurance principle; and

WHEREAS: A resolution of parallel intention has been adopted by the California Medical Association covering medical and hospital attention, be it

Resolved: That the Councils of the California and Southern California State Dental Associations recommend that legislation be proposed seeking to establish a health insurance system, mandatory as to certain population groups and voluntary as to certain population groups, which shall include the following principles:

1. The patient shall have absolutely free choice of dentist and hospital.
2. The dental professions shall through their representative organization determine the scope, extent, standards, quality, compensation paid for, and all other matters and things related to dental and dental auxiliary services rendered under the system.
3. There shall be no provision for cash benefits.
4. The patient shall receive adequate treatment and his dentist shall receive adequate compensation.
5. The foregoing principles shall be maintained with such modifications thereof as may from time to time be recommended, or approved by the profession. Be it further

Resolved: That the California and Southern California State Dental Associations immediately offer their full aid and cooperation to the Interim Committee of the Senate of the State of California charged with the study of this problem and the California Medical Association to the end that any measure which shall be passed establishing a health insurance system at the 1935 session of the California Legislature shall contain the above principles; and be it further

Resolved: That there be formed a special committee authorized and empowered to act herein, constituted as follows: the presidents of the California and Southern California State Dental associations, the chairmen of the legislative committees of the California and Southern California State Dental associations, J. Franklyn Cook, and Ernest G. Sloman.

WAGNER-LEWIS BILL

The latest reports from Washington (April 2) are that the House Committee is conducting executive hearings on the social security legislation. Open hearings have been completed. Some effort has been made to separate unemployment insurance and old age pensions from the complete bill. This effect has apparently been unsuccessful.

The Senate bill (Wagner's) which is identical with the House bill (Lewis') is awaiting hearings in the Senate Finance Committee. Nothing has been done to date.

ONTARIO'S NEW MEDICAL SERVICE PLAN

The Ontario Government through its welfare department entered into an arrangement with the Ontario Medical Association whereby the government pays the association 25 cents per month for the medical care, including medicine, of each person on relief. The recipients on relief may choose their own physician, who renders an account to the medical society for treatment given at his regular fees and is paid his proper portion of the entire amount available. The association may keep 5 cents of every 25 to cover the costs of administration. If the total amount of bills sent in exceeds the total money available, the doctor will receive only a part of his original account.

FRED J. CONBOY,
Toronto, Canada.

HOUSE PASSES MEASURE RESTRICTING DENTISTRY

The Minnesota House, after brief debates, passed a bill Thursday raising new and drastic restrictions around the practice of dentistry.

The dental bill would abolish the corporate practice of dentistry and prohibit all advertising except for small professional cards by specialists. Dentists would be forbidden to advertise painless extractions, and the bill would prohibit lettering on doors more than 7 inches high. The bill passed, 109 to 4.

Representative J. J. White of Ogilvie, speaking against the bill, asserted it would drive out of business dentists who have charged low fees and survived only because of large practices obtained through advertising.

A companion bill, providing for licensing of dental hygienists, was passed, 99 to 0.—*St. Paul (Minn.) Press,* March 1, 1935.

RULES AGAINST MEDICAL SERVICE BY CORPORATION

Chief Justice Michael L. McKinley of the Superior court rules that a corporation is not permitted under Illinois statutes to practice medicine. The decision, if upheld by the Supreme court, is expected to have a far-reaching effect and may result in the closing of several organizations now devoted to the practice of dentistry.

The case was brought by Attorney General Otto Kerner on a quo warranto proceeding questioning the right of the United Medical Service, Inc., 23 East Jackson Boulevard, to practice medicine. The service was organized two years ago and has been subjected to criticism by members of the Illinois and the Chicago Medical societies.

Judge McKinley pointed out that the Supreme court has held that a corporation cannot practice law and held that ruling as a precedent for his own decision that a corporation cannot practice medicine. What effect the ruling will have upon hospitals, clinics and similar institutions, was not immediately determined. Judge McKinley passed over them in his written opinion, stating that their status was not questioned during the hearings. . . .

At the attorney general's office, it was explained that the ruling will not automatically compel organizations to cease practicing medicine, but that the decision, if upheld by the state Supreme court, would be a precedent upon which the state could institute quo warranto proceedings against those institutions.—*Chicago Daily News,* March 22, 1935.

DENTISTRY BILL SIGNED

Governor Paul V. McNutt signed a bill yesterday which gives the State Board of Dental Examination and Registration broad powers to regulate the practices of Indiana dentists. The bill gives the board authority to revoke licenses for a long list of "unprofessional" actions. These include false advertising, the use of large advertising boards, the advertising of painless dentistry or professional superiority over other dentists. Dentists would be limited to the use of signs with letters of not more than seven inches in height. The license fee also is increased from $1.75 to $3.00.—*Indianapolis (Ind.) Star,* Feb. 28, 1935.

THE CHICAGO INDUSTRIAL DIAGNOSTIC SERVICE

By Bernard D. Friedman, D.D.S., Chicago, Ill.

The industrial diagnostic service of the Chicago Dental Society was inaugurated to serve two purposes: 1. To educate employed people to the realization of the value of regular dental care. 2. To increase dental office practice. After two years of operation, the results indicate the successful accomplishment of both these purposes.

This plan calls for an agreement between the industrial plant manager and the diagnostic committee whereby the plant employes are to receive a full mouth examination including roentgen-ray films at no cost either to the employer or the employe. When this agreement is reached, the examining equipment, consisting of two portable dental chairs, x-ray machine, instruments and records, is installed in a suitable room at the plant.

At a time convenient to the plant maangement, the employes are addressed by a dentist, who explains the details of the plan and gives his audience a dental health talk. Immediately thereafter, the examination of the teeth and jaws by the roentgen rays begins.

The employes are ushered into the examination room in such sequence that while one is being examined, only one is awaiting his turn. Thus, each employe loses but a minimum of time from his work. A fourteen film survey is made for each one. At the end of each day, the films are developed and returned. When a sufficient number of pictures are available, approximately a week later, the clinical examinations begin.

The employes are sent in as before and, with the aid of the completed roentgen-ray survey, are given a careful and complete dental examination and diagnosis by a competent member of the profession.

The findings of the examiner are recorded by his assistant on a triplicate examination sheet. One of the sheets is left at the plant for use in checking up. The other two are sent to the dental society's office, one for its records and the other for the employe's dentist and sent to him only at his request. Certain general information besides the dental record is recorded on this examination sheet. As he examines each employe, the dentist gives advice regarding the dental condition found. He also secures the employe's permission to mail the roentgen-ray films with an explanatory letter to his dentist. This

letter requests the dentist to phone or write the employe for an appointment. Six months after the original examination, a representative percentage of the employes are reexamined and their dental conditions checked against the record card on file at the plant. During the six-month interval, the plant managers, foreman and assistants endeavor to have the employes secure any service they may require.

The check-up in one plant yielded the following facts:

Employes examined	1,500
Employes reexamined after 6 months	250
Employes who reported to dentist	172
Employes who received dental services	148
Employes reported and arranged for work to be done later	24
Estimated amount spent by group receiving service	$ 2,574.00
Estimated amount spent per employe	$ 17.39
Estimated amount spent by all employes	$18,259.50
Reporting to their dentist	70 per cent
Not reporting to their dentist	30 per cent

In evaluating these results, two fundamental factors must be borne in mind (1) that the majority of the employes of this company were of the laboring class, having exceedingly low incomes, and hence these fees are based on those charged in the poorer neighborhoods of the city; and (2) that many of these employes are foreigners who speak little or no English, and are, therefore, poor subjects for dental health education.

In other plants, where the caliber of employes is higher, we may expect a much higher return. Also, we may find in some instances that members of the employe's family spent as much money for dental care as did the wage-earner himself.

The financing of the plan was accomplished by appealing to the dental dealers for an increase in their advertising expenditures in the *Bulletin,* the official publication of the society. It was pointed out to them that the resultant increase in the income of the dentists which the service would undoubtedly stimulate would increase the sale of dental supplies. We are happy to say that they responded whole-heartedly and enabled us to carry on for two years.

We now contemplate expanding the service by placing four or five crews in the field. We cannot expect the dental industry to completely finance us indefinitely and we are now engaged in developing a plan whereby the prime beneficiaries (the dentists) will bear the major portion of the expense involved.

THE WAYNE COUNTY MEDICAL SOCIETY, DETROIT, PLAN

Complete medical service without the use of the insurance principle is being offered and given to wage earners of Detroit through a plan developed and put into operation by the Wayne County Medical Society, Detroit. A demonstration set-up is bringing medical care to hundreds of employed persons of small means, people who do not want paternalism or charity but merely credit.

The salaried class, which is able to handle its own medical problems, being eliminated, the remaining three classes of people in Detroit can procure medical service through the agency of the Wayne County Medical Society:

1. The unemployed on welfare rolls receive home and office medical service by the family physician, dentist and so on, through the Medical-Dental Bureau, operated by the Wayne County Medical Society in its building. The cost of this agency is met by the FERA.

2. The unemployed not on welfare rolls are cared for in Detroit through the Medical Relief Committee of the Wayne County Medical Society. The family physician or volun-

teers who serve these people with home and office care at no fees, or at small fees, assist the patient to maintain his self-respect.

3. Unemployed persons earning small wages or salaries are cared for in Detroit by the bureau developed from the Wayne County Medical Society plan.

This plan offers complete medical care, comprising the services of physicians, hospitals, dentists, nurses and pharmacists, at a fee that can be paid by easy time payments within a year's time or less.

The purpose of the Wayne County Medical Society Bureau is to assure employed people of modest income that they can go to the physician of their choice and receive necessary medical service when they need it. Furthermore, the bureau works out a plan for them whereby the account can be paid from week to week.

The bureau is under the direct financial and executive control of the board of trustees of the Wayne County Medical Society. An advisory committee called the Board of Arbitration aids the board of trustees with recommendations regarding details of operation, handles disputes and assists the smooth performance of the bureau. Representatives of the various cooperating professional groups are seated on the Board of Arbitration. The bureau is under the coordinating supervision of the executive secretary of the Wayne County Medical Society.—*J.A.M.A.*, October, 1934.

A NEW AGE

A new age of collectivism is emerging. Just what the specific form of this phase of acute interdependence is to be is by no means clear. "It may involve the limiting of supplanting of private property by public property or it may entail the preservation of private property, extended and distributed among the masses. Most likely, it will issue from a process of experimentation and will represent a composite of historic doctrines and social conceptions yet to appear. Almost certainly it will involve a larger measure of compulsory as well as voluntary cooperation of citizens in the conduct of the complex national economy, a corresponding enlargement of the functions of government, and increasing state intervention in fundamental branches of economy previously left to individual discretion and initiative—a state intervention that in some instances may be direct and mandatory and in others indirect and facilitative."—William C. Knoelk, Milwaukee, President, American Interprofessional Institute.

WILL AMERICA COPY GERMANY'S MISTAKES?

A recently issued pamphlet contains a brief résumé of two books written in Germany by Gustav Hartz, of Berlin: "Errors of Germany's Social Politics" and "Bank-Book Instead of Alms." Mr. Hartz, who has risen from the ranks of hard work and poverty, writes from the workman's point of view, not the employer's. His books are based upon a study of facts and procedure which has given him a place as one of the foremost economists of his country. He has a plan which he considers infinitely superior to social insurance, namely, compulsory savings. He proposes that every worker be compelled by law to save a certain percentage of his earnings, deposit them at interest in his own name in a bank under government protection, and, out of them, take care of his own rainy days; create his own security. Every dentist interested in economics should read this pamphlet reprinted from the *New York State Journal of Medicine*, March 1, 1935, and distributed by the Bureau of Public Relations, Medical Society of the State of New York. 2 East 103rd Street, New York City.

CURRENT LITERATURE

Ulcerative Vulvitis and Stomatitis of Endocrine Origin, (A. J. Zimmerman, J.A.M.A., Mar. 9, 1935): Wien and Perlstein reported twenty-nine of these nonvenereal, coexisting oral and genital lesions, collected from the literature. A case in a 23-year-old girl with the lesions appearing periodically and definitely associated with the onset and duration of the menstrual period is reported. The ulcers were from 2 to 5 cm. long, covered with a grayish pellicle and revealing a bleeding base on removal of this covering. The oral lesions caused an aching pain which became stablike on eating or drinking. These lesions had been present for ten years, with the exception of a five months' pregnancy period. Pituitary organotherapy followed by roentgen therapy gave relief.

HAMILTON ROBINSON.

Calcium and Phosphorus Content of Offspring After Feeding Vitamin D to Mother Rat (W. W. Swanson & L. V. Iob, Am. J. Dis. Child., January, 1935): The effect of administration of viosterol or cod liver oil to the mother rat on the calcium and phosphorus transmission to the fetus was studied in more than 300 rat pups. Data obtained showed that the ash of the rat pups from the group receiving 0.2 c.c. of viosterol (250 D) daily had a calcium content 9.0 per cent greater and a phosphorus content 11 per cent higher than the ash of the control pups. When the mothers received 0.2 c.c. of cod liver oil daily, the ash of the offspring contained 10 per cent more calcium and 12 per cent more phosphorus than the control groups. The ratio of the dosage of viosterol and cod liver oil (in Steenboch units) administered to bring about changes in ash content is 150 to 1.

M. K. HINE.

Aerobic Oral Flora of Mothers and Children (R. Withowski, Zentrabl. f. Bakt., Feb. 18, 1935): The investigation of fifty mothers and children is reported. The former were examined shortly before delivery and two or three days after; the latter were examined at birth and after from two to five days. It is concluded that the vaginal flora of mothers is represented in the children and is influenced by the conditions at birth. The pathologic organisms of the child's flora, pneumococci, streptococci, staphylococci, etc., have their origin from the environment of the child and the mother's oral flora. Pathogenic organisms appear after two days.

B. G. BIBBY.

Effect of Moccasin Snake Venom (Ancistrodon Piscivorus) in Hemorrhagic Conditions (Peck & Rosenthal, J.A.M.A., March 30, 1935): Injection of a 1:3,000 solution of venom subcutaneously in 0.4 c.c. dosage was found to be superior to other methods of treatment in hemorrhagic conditions other than hemophilia and thrombocytopenic purpura hemorrhagica. The injections were usually given twice a week over a three-month period. Twenty-eight case reports are cited with this treatment used in the various conditions associated with hemorrhagic tendencies. Five cases which included bleeding from the lips and gums are among these reports. The blood picture is apparently left unaltered by the treatment, but its effect is probably through some change in the blood vessel wall or in the clotting factors of the blood.

HAMILTON ROBINSON.

Snake Venom Solution Moccasin (Lederle) (J.A.M.A., March 30, 1935): The Council on Pharmacy and Chemistry of the A.M.A., having reviewed this product, considered the therapeutic value difficult to determine on the basis of available evidence and therefore voted that further consideration be deferred until more evidence should be available. HAMILTON ROBINSON.

White Sponge Nevus of the Mucosa (Naevus Spongiosus Albus Mucosae) (A. B. Cannon, Arch. Derm. & Syph., March, 1935): A peculiar whitish lesion of the oral, vaginal and upper anal mucosae was observed in a female patient. One of the patient's two children, her mother, a brother, two sisters and a maternal aunt showed similiar "white mouths." The patient presented a white or opalescent and spongy oral mucosa with numerous small follicular openings and similar lesions in the vagina and upper anal tract. Biopsy showed chiefly in the epidermis, which was "thickened, moist and dyskeratotic" and showed elongation and fusion of the rete pegs. The lesions were clinically distinquishable from leukoplakia and lichen planus. The name "white sponge nevus of the mucosa" (naevus spongiosus albus mucosae) is proposed.

HAMILTON ROBINSON.

Sarcoma of the Tongue (J. C. Ross, Brit. M. J., Jan. 12, 1935): If rare congenital neoplasms are excluded, this uncommon condition is a disease of adult life. Males are twice as susceptible as females. The importance of trauma in causation is uncertain. Although five histologic types are differentiated, clinically, they all appear as rounded, firm, elastic, fibrous, white or slightly pink, intraglossal masses. The most important differential diagnosis to be made is distinquishing these sarcoma from the nodular type carcinoma. The former differ from the latter in that (1) they appear earlier in life, (2) pain is rare, (3) they are not tender and are of firm elastic consistency, (4) ulceration appears only opposite jagged teeth and (5) they appear in the substance of the tongue as an intraglossal mass. Final diagnosis must be made microscopically. Prognosis is not so gloomy as might be anticipated.

B. G. BIBBY.

Hazards of Publicity—A Communication from the Committee on Public Health (New England J. Med., March 21, 1935): The committee urges that the long lived persistence of the medical attitude in regard to publicity should not be modified without serious thought. They note the difficulty of maintaining the traditional conservatism. It has been urged that the profession become more articulate. In business, this means advertising; in war, it means propaganda. Since the war, it has been called education. In its medical relationship, it is called public health education and is sponsored by official endorsements of societies, associations, colleges. By any name, it is the same in the eyes of the world. Publicity has established religions, won and lost wars, sold automobiles and brought people to doctors, but it has its hazards. The radio presents the greatest difficulty. Good medical broadcasts made and delivered by good men are given, but, in delivery, are mixed with the general publicity of radio advertising. The medical educator advocates vitamin A for resistance to infection and next it is to be bought in cough drops. If the educator refuses to be emphatic, the radio advertiser is emphatic. The scientist baits the hook; the advertiser catches the fish. Also he is misquoted a dozen times a day. Other worse results are apparent. The public is assured of results from certain sources before any evidence is produced. Advertising method must be imaginative, must dramatize, must exaggerate, or it ceases to function. Scientist and medical practitioner lose the faith of the public as a result. How can the physician compete—one voice in a babel of voices—with the glib delivery, the humor, the entertainment of the paid and paying advertiser? The hack writer surpasses the reasoning clinician in getting the confidence of, and making sales to, the public. He standardizes the populace and sells a cure, while the physician pores over the individual before he prescribes.

T.

Medicodental Teaching, Graduate and Undergraduate (Current Comment, New York J. Med., Feb. 1, 1935): This subject was discussed at the fourth Joint Medical-Dental Meeting arranged by the five county medical societies and the two district dental societies of New York City, Dec. 3, 1934, under the auspices of the "Better

Dentistry Meeting." Dr. Magid presented the results of a questionnaire sent to every medical and dental school in the United States and Canada as a survey of the present status of medical-dental teaching. One hundred forty questionnaires were sent to ninety medical colleges, of which seventy responded, and to fifty dental colleges, of which twenty-five responded. Magid showed lantern slide tabulations and read excerpts of letters from deans of medical and dental schools. These indicated a wide difference in practice and opinions. Dr. Gies discussed the report. He gave a statement of the historic disregard and inappreciation by medicine of dentistry, with reasons for the situation. He emphasized the importance of dentistry in its relation to health service, emphasized the patient's need as the incentive to bring the professions together. He cited the unsatisfactoriness of questionnaires to elicit information, with the reasons, and then showed the weakness of the questions asked and the undependability of the answers. He also stated that some of the most influential schools did not reply. Succinctly, he says, "Questionnaires regarding what is being done yield instructive responses only when constructive activity is in progress." Gies then suggested the following as the line to follow for distinguished results. "1. After due study, formulate a statement of the principles and conditions which, in your judgment, the faculties of medical and dental schools should establish to promote understanding, in medical and dental students, of the responsibilities and opportunities of physicians and dentists to cooperate in behalf of the patient. 2. Forward to each medical and dental school, and to the Council on Medical Education, a copy of the statement thus formulated. With the statement send two requests: one asking for reasons, if any, why the proposed plan could not be made operative; another asking for suggestions of improvement of the plan. 3. Send, to each of the schools and councils, copies of the replies of these two requests. 4. Meanwhile, and as a closely related supplementary endeavor, compile a clear and factual statement of the efforts actually being made, and the ensuing results in some of the leading medico-dental centers to promote both knowledge and understanding, among medical and dental students, of the mutual obligations of physicians and dentists in practice and cooperation. Send copies of this compilation to each of the schools and councils. In this effort, medico-dental conditions at the following illustrative universities—as ascertained directly by you or for you—would be particularly instructive and useful, either positively or negatively: California, Chicago, Columbia, Cornell, Harvard, Johns Hopkins, Michigan, Northwestern, Oregon, Pennsylvania, Rochester, Tulane, Washington, Western Reserve, Yale. If you directed your efforts, soon and effectively, in accordance with or in extension of the program just indicated, your committee in charge of these matters would, I believe, be able to present a very constructive report at your next annual convention, as a basis for further action."

T.

Transplantation of Tooth Germ Elements and Experimental Heterotopic Formation of Dentin and Enamel (C. B. Huggins, H. R. McCarroll and A. A. Dahlberg, J. Exper. Med., Aug. 1, 1934): The relationship of calcified elements of tooth to epithelium, being similar to bone forming after epithelial transplantation, gave rise to the attempt to induce extraoral formation of dentin and enamel; also the heterotopic occurrence of teeth lent support to the idea of the experiment. Dental follicles were removed from the jaws of dogs 3 and 6 weeks old. The follicles were opened and the calcified cone of dentin and enamel was discarded. Grafts were selected of pulp with its odontoblasts and enamel organ and planted between the abdominal wall muscles. The grafts also were transplanted in various combinations. Since this method was employed, a mixed result in the way of calcified elements was to be expected. Great variations resulted, depending on the nature and relationships of the materials used for transplantation.

The six series of experiments that were run are described separately and clearly. Concisely, dentin and enamel formation took place. Aside from this, the most interesting feature of the experiments was the epithelial cytomorphosis. Further researches on the subject are being carried on by the authors.

T.

Speech Training After Cleft Palate Operation: My 22 months old baby boy was born with a right complete cleft of the soft and hard palate, the alveolar arch and the lip. He was immediately placed in the hands of an able surgeon, who completed a splendid repair when the child was 14 months old. Now that he has begun to talk he has been unable to pronounce letters that depend on the soft palate. He pronounces m and n well but pronounces "daddy" as though it were spelled with n and says nang for bang, and so on. Will you kindly advise what measures may help in speech training, voice culture or phonetics to overcome this impediment?

Perhaps the most important single factor in correct speech is a freely movable muscular sphincter that includes the superior constrictor of the pharynx and a freely movable soft palate. If the soft palate does not completely close, there will be a leak of air into the nose and consequently nasal speech, and, unless corrected, the inability to make the hard consonants understood. M and n normally go through the nose. However, trouble in making people understand hard consonants is apt to set up a vicious circle in a child's speech in that he says them rapidly to get it over with and may become discouraged and even lazy in attempting to overcome the difficulty. This point is illustrated by the child's being able to say mama but not being able to say daddy. The first consideration in the repair is to decide whether further surgery in an effort to lengthen the palate would be of benefit. Whether or not operation is done or is necessary, it is almost always necessary for the child to have careful speech training to get good speech. This is best accomplished by one trained in the work, and most communities nowadays have such a trained worker available either in special institutions or in public schools. Where this is not available, it is probably worth while for the mother herself to arrange a consultation with a speech trainer and learn some of the fundamentals of the methods used. Then it is best to have classes at definite periods with the patient, encourage him, reward him and show him the benefits of clear speech rather than correct him each time he makes an error in speech. It is preferable, if possible, to have this help given by some one outside the family who is not accustomed to the child's speech. The Central Institute for the Deaf, 818 South Kingshighway, St. Louis, can probably supply more definite information.—*J.A.M.A.,* March 16, 1935.

Antirachitic Concentrates (D. J. Barnes, J. Michigan M. Soc., April, 1933): Barnes reviews the recommendations of various authorities regarding the dosage of cod liver oil. Because of the probable intolerance of doses of oil sufficient to act as a curative agent in rachitis, he recommends a concentrate. He also stresses the importance of including adequate doses of vitamin A along with the vitamin D. He states that viosterol is not equal, unit for unit, with cod liver oil in preventing and curing rickets, nor does irradiated ergosterol possess the same vitamin D as is represented in cod liver oil. Halibut liver oil, known as haliver oil, contains one hundred times the vitamin A content and from fifteen to twenty times the vitamin D content of plain cod liver oil. The dosage is difficult to regulate, as 2 minims of this oil furnishes as much vitamin A as 3 teaspoonfuls of cod liver oil, and the same amount would furnish only as much vitamin D as is represented by from 30 to 40 minims of cod liver oil. Barnes relates briefly his experience with vitamin D milk in a special experiment which was being carried on at the time of writing.—*Am. J. Dis. Child.,* March, 1935.

Diet of Texas School Children (Jessie Whitacre, Texas Agr. Exper. Stat. Bull. 489, 1934): This report is based on a

survey of the diet of Texas school children, with special regard to regional, seasonal and racial differences. The subjects included 993 white children, 471 Negro children and 153 Mexican children from different parts of the state. Racial differences in regard to the kinds of foods used were less marked than is commonly supposed. All three racial groups appeared to have a deficiency in the use of milk, fruit, vegetables and whole cereals. The Mexicans drank a great deal more tea and coffee than either the white or the Negro children. Girls had slightly better diets than boys. There was little difference in the diets of various seasons of the year and in different districts. The findings suggest that there are good reasons for continued emphasis on the liberal use of milk, fruits, vegetables and whole cereals in the diet of growing children.—*Am. J. Dis. Child.*, March, 1935.

Major Trigeminal Neuralgia (By Francis C. Grant, Am. J. Surg., March, 1935): The author gives three diagnostic certainties of the disease: pain, characteristic distribution and character of the pain. The disease is one of elderly people from the fourth decade on. Women are more frequently affected than men. The attack begins in either the second or third divisions usually. No more is known of this disease than when described by Fothergill. Only one treatment exists: the pathways from face to brain must be blocked. Two methods are employed: alcohol injection and section of the sensory root behind the ganglion. The author reports 100 operations, making the temporal approach, with only one death.

T.

Is Agranulocytosis a New Disease? (By Fred Stenn, Am. J. Surg., March, 1935): Stenn collects historical data to show that the disease agranulocytosis was recognized long before Brown and Ophüls described it in 1902. Symptom pictures are collected that indicate its recognition in the time of Hippocrates. In 1857, Adolphe Gubler; in 1859, Fernie; in 1860, Musset, and in 1865, Trousseau described the disease closely enough to suggest that putrid sore throat of those days and agranulocytosis refer to the same malady.

T.

Viosterol Preparations and Gallstones: The widespread clinical administration of viosterol preparations has raised problems concerning several possible late effects and side actions. Among these questions is that of the formation of gallstones. Since calcium is concerned in their formation, an increase in the calcium content of the bile might predispose to gallstones. This problem is perhaps particularly acute in pregnancy, in which the incidence of gallstones is already high. Jones and Laing (Effect of Viosterol on Calcium Content of Dog's Bile, *Am. J. Physiol., 110:471* [Dec. 1] 1934) have recently undertaken to ascertain whether the current use of viosterol preparations might lead to an increased output of calcium in the bile in dogs. Twenty-five dogs were used in their experiments. The gallbladder was removed and the common duct or cystic duct cannulated and the flow into the cannula brought externally and collected. The dogs were kept on a standard diet with the addition of viosterol. Two concentrations were used: either the viosterol in oil, a preparation containing not less than 9,000 units (U.S.P. X, Revised, 1934) of vitamin D or a special preparation, not commercially available, 100 times as potent as the former. One hundred and ninety-three analyses of bile calcium before the administration of a viosterol preparation were made and seventy-three after the daily administration of from 5 to 10 c.c. of viosterol in oil, which is a dose from four to eight times larger than that ordinarily recommended as the maximum therapeutic dose for man. The data obtained were treated statistically and it was found that the mean value of normal bile calcium was 13.64 ± 0.14 mg. per hundred cubic centimeters, with a standard deviation of 2.90 ± 0.10. After the administration of viosterol the mean was 14.44 ± 0.13, with a standard deviation of 2.57 ± 0.09. The difference, then, calculated between the lower limit of mean after

administration of the viosterol preparation and the upper limit before was only 0.53 mg. per hundred cubic centimeters of bile —an essentially negligible factor. The blood calcium and bile output were not essentially modified in the experiments. The Northwestern investigators also gave 1 c.c. of the special preparation before mentioned to three dogs intravenously for three or four days in succession. After this, the blood calcium and bile calcium contents were increased and the output of bile was definitely decreased. It was therefore evident that doses of viosterol preparations considerably larger than would ordinarily be used in clinical practice do not raise the bile calcium concentration or modify bile output in the dog. Doses of viosterol preparations large enough to increase definitely the blood calcium level will increase the bile calcium concentration and decrease the output of bile. Clinical confirmation of these interesting experimental conclusions is desirable. Jones and Laing hoped to obtain this confirmation on patients with chronic biliary fistulas, but had not yet been able to do this. When and if confirmation is obtained, one more possible danger of viosterol administration will be eliminated.—Editorial, *J.A.M.A.*, Feb. 23, 1935.

Why Cancer Is Not Recognized Early (W. C. MacCarty, Am. J. Cancer, December, 1934): MacCarty selected at random 100 cancers of the stomach removed surgically. Throughout the 100 clinical histories, one finds such terms or expressions as pain (dull or sharp, sudden or burning), weakness, tired feeling, nausea, vomiting, flatulence, bloating, sour eructations, feeling of fulness, indigestion, stomach trouble and periodicity of symptoms. Reports of the physical examination, contrary to the classic descriptions in textbooks, show absence of such features as emaciation, palpable tumor in the epigastrium, anasarca, accessory nodules, cachexia, pallor, edema of the legs, hematemesis, tarry stools and loss of weight greater than might be explained by a restricted diet. Strangely, also gastric acidity was high rather than low, and the hemoglobin records were normal in the great majority of cases. None of these signs, symptoms or laboratory observations are pathognomonic of cancer. All may be found when no cancer is present, as in simple gastric ulcer, duodenal ulcer and, frequently, in association with cholecystitis and even appendicitis. Such symptoms are common in any group of Americans, and certainly not all of these have cancer. It is fair to suspect, however, that some may have cancer, and this cannot be determined by signs and symptoms alone. As long as physicians continue to wait for the textbook picture of cancer, they will continue to find a high proportion of hopeless cases. Cancer does occur as a small lesion. As such, its signs and symptoms are not those described for cancer in the textbooks of pathology and of the practice of medicine. Cancers are not recognized early and never will be until physicians learn that there are no characteristic signs and symptoms for early cancer and that the only means of telling whether the condition is gastric, duodenal, appendical or in the gallbladder is by the x-rays. It makes little difference for the present whether pathologists believe that cancer can be diagnosed from cells alone or not. The risk of cancer is still greater than the risk of removing a few benign ulcers, which may be cancer so far as signs, symptoms, roentgen data and gross appearance are concerned.—*J.A.M.A.*, Feb. 23, 1935.

Salivary Calculi. III. Simple Surgical Method of Dealing with Salivary Calculi in Submaxillary Ducts. (By A. L. Beck, Laryngoscope, December, 1934): Beck states that the chief difficulties in the removal of a salivary calculus may be overcome if the parts can be immobilized at will while the work proceeds. This immobilization is accomplished by means of silk traction sutures temporarily placed for the duration of the operation. The tissue is grasped close to and beneath the papilla with small forceps, and one suture is placed on each side of the wall of the duct through its orifice and given to an assistant, who exerts countertraction, converting the small orifice into a fairly large slit. At the same

time this traction brings about immobilization of that submaxillary gland duct and lifts the duct away from the floor of the mouth. The sutures may be held by an assistant or may be conveniently hooked round the teeth, at the point of emergence from the mouth. With the duct orifice thus held in position, a Bowman lacrimal probe is passed for detection of the calculus, after which a Bowman canaliculus knife is inserted and the duct slit open far enough to expose the calculus. At a depth adjacent to the calculus, it may be necessary to complete the slitting with scissors. When thus exposed, removal of the stone is not difficult.—Abstr. *J.A.M.A.*, Feb. 23, 1935.

Sinus Into Antrum: About a year ago, a man, aged 55, had a tooth extracted, and an infection of the antrum developed. There were the usual symptoms of pain and purulent discharge, for which he did nothing until several weeks elapsed and then I saw him, though only for a few times, as he thought that he could care for himself. Now he comes with a sinus that is quite open, with a little discharge, and expects it to be healed in a short time. Will you please give me the best treatment for it? Will irrigations do any good and also is curettement of the antrum indicated?

The fistula that occasionally develops after extraction of a tooth the root of which extends to or into the maxillary sinus is often resistant to treatments so far as closure is concerned. If there is a change in the mucosa of the antrum it would be necessary to operate either intranasally or by way of the canine fossa, removing all diseased tissue, freshening the edges of the fistula, and suturing. In some cases in which the changes in the antrum are not definite, a few irrigations followed by freshening of the edges of the mucosa of the fistula, and suturing, may suffice. In other cases, it is impossible to approximate the edges of the mucous membrane without making a flap in order to effect the perfect closure of the opening leading into the antrum.—*J.A.M.A.*, Feb. 9, 1935.

The Chemical Composition of Saliva and Blood Serum of Children in Relation to Dental Caries (Rebecca B. Hubbell, Am. J. Physiol., August, 1933): Analyses were made of the saliva and blood serum of fifteen children who were free from caries and of seventeen who had active caries. These children were from 9 to 16 years of age. The carbon dioxide capacity of the saliva of the children free from caries was about 44 per cent higher than that of the saliva of children of the same age who had active caries. The titratable alkaline of the saliva of the children free from caries was about 24 per cent higher than that of the children of the same age who had active caries. In other respects, analyses of the saliva (determination of the total solids, ash, calcium, phosphorus, chloride, diastatic activity and p_H) showed no consistent differences between the two groups. The blood serum calcium, inorganic acid-soluble phosphorus, carbon dioxide capacity and p_H were the same for the children of both groups.—Abstr. *Am. J. Dis. Child.*, February, 1935.

A Study of the Total and Ultrafiltrable Calcium and the Acid Soluble Phosphate Content of the Blood Serum of Four Hundred and Twenty-Two Healthy Children (M. S. Needles and C. M. Marberg, J. Lab. & Clin. Med., September, 1933): The study was undertaken in order to determine whether there is any relation between calcium and phosphorus metabolism and osseous development and the incidence of dental caries. Three hundred and twenty-three children (the test group) were put on the standard Mooseheart diet for one year, and, during a second year, in addition to this diet, were given a pint of orange juice and the juice of one lemon daily. A second group was used as a control. This group consisted of ninety-one subjects, who were kept on the standard Mooseheart diet. All the children were healthy, and all other conditions of living were identical. The final results showed that there is no relation between the calcium and phosphorus content of the blood serum and dental caries. A summary of the technic is given. —Abstr. *Am. J. Dis. Child.*, February, 1935.

Effect of Vitamins and the Inorganic Elements on Growth and Resistance to Disease in Children (Alan Brown and Frederick F. Tisdall, Ann. Int. Med., September, 1933): These authors call attention to the fact that at least ten inorganic elements are necessary for life, but that only in the case of calcium, iron and iodine should the supply of these elements not be left to chance. The effect produced by lack of the various vitamins and the sources of the vitamins are discussed. Studies are presented bearing on the importance of these food elements to growth and resistance to infection. A lack of vitamin B complex and also of vitamin D lowered the resistance of rats to infection. The authors also present evidence that, for the first time, dental caries indistinguishable from the human type has been produced in rats and that such caries may be either prevented or cured by adequate amounts of vitamin D and phosphorus in the diet. Vitamin D in the form of viosterol dissolved in corn oil was added to the shortening used in bread. Such bread is now being produced for sale on the market. A special cereal is advocated, which is rich in the necessary vitamins and inorganic elements, as a means of making these substances further available.—Abstr. *Am. J. Dis. Child.*, February, 1935.

Foreign Literature

Influence of the Prophylaxis of Rickets on the Milk Teeth (J. J. Soer, Maandschr. v. kindergeneesk., April, 1934): For three years, the author prescribed for 536 children at his infant welfare center in Dordrecht a preparation of vitamin D, to prevent rickets. The result were controlled by roentgenograms of the wrist. Of the treated children, only six showed mild rickets. Later, the author (following the example of Mrs. Mellanby) studied the deciduous teeth of 180 children, now about 8 years old, to determine the influence of previous rickets. Any sign of rickets which the children had presented in their first year and the amount of vitamin D which they had received were known from the first experiment. Even among the children who received sufficient antirachitic prophylaxis, a high percentage of carious teeth was observed. The author concludes that, as the crowns of the deciduous teeth are already finished at birth, it should be necessary to treat the mothers during pregnancy to prevent caries in the deciduous teeth of the children. The prophylactic treatment of rickets should have more effect on the permanent teeth.—*Am. J. Dis. Child.*, March, 1935.

Harelip and Cleft Palate (E. Casella, Rev. Med., November, 1933): The embryologic and anatomic considerations of these conditions are fully discussed, and many illustrations are given to determine the etiology. The steps in the surgical treatment are described in detail. There are many photographs and colored drawings, and the bibliography is excellent.—*Am. J. Dis. Child.*, March, 1935.

Agranulocytosis with Recovery (A. Barfred, Ugeskr. f. Laeger, Jan. 3, 1935): In Barfred's case, originated after treatment with amidopyrine, treatment with pentnucleotide and a liver extract (hepsol) was followed by rapid recovery. Tabulation of the course of the blood picture in five cases with recovery reported in the literature and in this case shows identical curves in all cases.—*J.A.M.A.*, March 16, 1935.

Setting of Dental Amalgams (Marie L. V. Gaylen, Brit. D. J., Feb. 5, 1935): This is Part III of an investigation reported from the Department of Metallurgy of the National Physical Laboratory on behalf of the Dental Investigation Committee. A detailed statement of the procedures followed is given with tables and graphs. The author finds neither of the formulas submitted by Paffenbarger and Sweeney to be satisfactory. The findings show that the tin content of a dental alloy is very critical and should be between 25 and 27 per cent; the tests carried out at room temperature differ appreciably from those carried out at mouth temperature; small variations of pestle pressure have a marked effect on the setting of amalgam and very erratic variations can be obtained by using the same

alloy and the thumbstall method of mixing, if standardized, is more effective than the mortar method.

T.

Germicidal Actions of Dental Filling Materials (J. Stewart Kinnear, New Zealand D. J., January, 1935): Kennear experimented with S. S. White oxyphosphates of zinc, Ames black copper cement, S. S. White silver B., S. S. White silicate, kryptex, DeTrey's silver amalgam 37, copper amalgam. He summarizes his findings as follows: Silver amalgam, zinc and copper cements, porcelain and silicate cement have practically no antiseptic action; certainly no persistent action after a few days. Gold and acolite are inert. Silver cements and germicidal silicates have a valuable antiseptic action but only the former can be placed with safety close to pulps. Copper amalgam has a persistent antiseptic action and seems to sterilize more by contact than by diffusion.

T.

Dental Caries and Goiter (R. E. T. Hewat, New Zealand D. J., January, 1935): In view of the fact that the incidence of goiter among New Zealand school children is comparable in magnitude with dental caries, Hewat made this study. The children of a school in a goitrous district were used in the investigation. Hewat concedes contradictory evidence due possibly to the limited number of children seen. The results, considered as a whole, suggest that the conditions responsible for medium or large goiter favor the onset of caries. No significance from a dental point of view is attached to the presence of incipient or slight goiter.

T.

Is Extraction a Menace to Dentistry? (F. H. Gaunson, Austral. J. Dent., Feb. 1, 1935): Gaunson's thesis is that the function of mastication is the prime essential if the type of denture regarded as characteristic of man is to be maintained. Modify the function and the whole plan of nature is disturbed. Compare the cuspid teeth of the fox and the dog. The evolution of teeth has been in response to need. As habits have developed to change these requirements, atrophy has resulted. As diet has improved, teeth have degenerated. The author observes that evolution of a degenerate nature has proceded so far in many people that judicious extraction indicates an intelligent realization of things as they are rather than a sign of incompetency.

T.

Bacteriologic Investigation into Some Filled Teeth (Guy E. Ellingham, Brit. D. J., Feb. 1, 1935): The author undertakes to determine the infective culpability of infected living pulps. He notes that the literature deals mostly with sepsis about teeth: periapical infection from nonvital teeth and chronic or acute general periodontitis. Prior to Haden, the vital tooth was regarded as sacrosanct. The pulp kept the tooth free from suspicion. Haden, and later Rickert, concludes that a tooth may remain "alive" and yet retain a degenerated vitality and harbor infection and this without showing symptoms. The filled tooth immediately becomes implicated. Ellingham, in a limited way, undertook his investigation, taking into account forty-two teeth. With the aid of a competent bacteriologist, he made his tests, selecting the teeth himself. Twenty-four teeth were infected. Dental infection was found where unaided judgment would have precluded it. In addition to the laboratory findings, the author gives two case histories to support his conclusions. He concludes that the teeth in both instances would have been less dangerous had they been frankly pulpless. He makes a plea for further investigation.

T.

NEWS

GEORGIA

Bill Introduced: Substitute for H. 365 proposes to prohibit the retail sale or distribution of barbituric acid, amytal, allonal, luminal, veronal or sodium amytal except on the prescription of a licensed physician, dentist or veterinarian.

ILLINOIS

Chicago Dental Society Elects New Officers: Newly elected officers of the Chicago Dental Society are: president, E. J. Ryan; president elect, John La Due; vice president, William E. Mayer; secretary, Walter J. Bray; treasurer, Joseph G. Wiedder.

Bills Introduced: H. 411 and S. 210 propose to impose on physicians, osteopaths, dentists, chiropractors, chiropodists and optometrists an annual occupational tax equal to 3 per cent of their gross receipts from practice.

Report of Midwinter Meeting Compiled: The final report of the Seventy-First Midwinter Clinic of the Chicago Dental Society which has just been compiled shows a registered attendance in excess of 8,000. The Exhibition Hall, which was practically sold out, had more than 10,000 visitors daily. The scientific program was outstanding in the type of its presentations and essayists. Several hundred clinics of exceptional merit were presented and entertainment and social affairs were previously unsurpassed.

Society Offices Moved: The new offices of the Chicago Dental Society are located in Suite 1400-1401 of the Michigan Boulevard Building, 30 North Michigan Avenue.

Judge McKinley Rules Against Corporate Practice of Medicine: "Corporations are denied any right to practice medicine," Judge Michael L. McKinley, of the Superior Court, ruled, March 22, in the quo warranto case of Attorney General Kerner against the United Medical Service, Inc., brought to determine whether a corporation may practice medicine. Judge McKinley held that a corporation is not permitted to practice medicine in this state. Harry Eugene Kelly represented the attorney general as special counsel. Judge McKinley found that the United Medical Service, Inc., was usurping the liberty, privileges, and franchise of engaging in the diagnosis and treatment of diseases of human beings, contrary to the Medical Practice Act, and that judgment should be entered ousting that corporation from the franchise, occupation, and business of "holding itself out to the public as being engaged in the diagnosis or treatment of ailments of human beings, and from suggesting, recommending, or prescribing any form of treatment for the palliation, relief, or cure of physical or mental ailments of persons, with the intention of receiving therefor, either directly or indirectly, any fee, or compensation, and from diagnosticating, or attempting to diagnosticate, operate upon, profess to heal, prescribe for, or otherwise treat, any ailment, or supposed ailment, of another, and from maintaining an office for the examination or treatment of persons afflicted or alleged or supposed to be afflicted, by any ailment; and from usurping, intruding itself into, or unlawfully holding or executing any such franchise, occupation, or business, either by or through the services of physicians and surgeons duly licensed and registered under the Medical Practice Act, and employed and paid by the respondent, or otherwise."—*Bull. Chicago Dental Society*, March 28, 1935.

INDIANA

New Dental Law—H. B. 218: The passage of this bill may be considered an historical event. Indiana has long desired and talked about a law which would curb fraudulent and misleading advertising. It seems

now that its ambitions in this direction are about to be realized.

LOUISIANA

State Society Officers: The newly elected officers of the Louisiana State Dental Society are: Sidney L. Tiblier, New Orleans, president; Malcolm E. Kaffie, Shreveport, vice president; Julian S. Bernhard, Shreveport, secretary; Oscar J. Ory, Garyville, treasurer. The next meeting will be held in Baton Rouge.

MISSOURI

Bill Enacted: S. 28 has become a law, prohibiting the cultivation, curing, preparation, distribution or possession of marijuana. It is not to be unlawful for any licensed pharmacist to possess and to dispense the drug on the written prescription of a physician, osteopath, dentist or veterinarian.

NEW JERSEY

Regents Rule No. 8 Decision: The Court of Appeals of New York State has just handed down a decision affirming the opinion of the lower court to the effect that a permanent injunction is ordered, restraining the Board of Regents from enforcing Rule No. 8. This case has been contested through the Courts for some time past and was instituted by a group of advertising dentists. They sought an injunction in the Supreme Court and Judge Loughran denied their plea. It was then carried to the Appellate Division and his decision was reversed. The Attorney General then carried the case to the Court of Appeals, the highest tribunal in the State. The Dental Society of the State of New York employed counsel to present certain facts to the court acting as "amicus curie." In this action the Allied Dental Council also took part. Rule No. 8 was passed about two years ago and immediately became the center of controversy. Rule No. 8 is as follows: "The following form of advertising is considered unprofessional and objectionable: the employment of letters, handbills, posters, circulars, cards, stereopticon slides, motion pictures, radio, newspapers or other advertising devices for the purpose of soliciting of patronage, except that a dentist may use personal professional cards of a modest type, announcing his name, title, address, telephone number and office hours." It is to be noted that Regents Rule No. 8 was a ruling of the Board of Regents and not a legislative act, and as such differs materially from the Dental Act in New Jersey. There is, therefore, no reason for apprehension as to the final outcome of the awaited decision on the test case of our law, now before the Supreme Court. Legal opinion of the highest rank has repeatedly suggested that our recent legislation is constitutional in every respect and should stand the test.—*New Jersey D. J.*, April, 1935.

NEW YORK

Bill Introduced: A. 1863 proposes to prohibit any experiment or investigation to be made on a living dog.

OREGON

Law Upheld: The constitutionality of the Oregon Dental Practice Act is upheld by the United States Supreme Court. The appeal in the case of Semler vs. the Oregon State Board of Dental Examiners will be dismissed, according to word received by the board from its attorneys.

Bill Enacted: H. 208 prohibits the distribution of amytal, luminal, veronal, barbital, acid diethylbarbituric, or any preparation or compound containing any of the foregoing substances, except on the prescription of a licensed physician, dentist or veterinary surgeon.

VERMONT

Bill Introduced: H. 254 proposes to forbid any person, other than a licensed physician or a licensed dentist, to use the title "doctor" or the abbreviation "Dr." in connection with his name on any sign, advertisement or "professional" card, unless the type of service rendered by him is also designated on such advertisement or "professional" card.

WASHINGTON

Bill Introduced: H. 640 proposes to make it unlawful for "any person, firm or corporation to operate a dental office unless said

person shall be a duly licensed dentist within the state of Washington." It shall be unlawful for "any person, firm or corporation operating or managing a dental office in the state of Washington to employ any person as a dentist or a dental assistant unless said person is a duly licensed dentist."

GENERAL

Bill in Congress: H. R. 6688, introduced by Representative Hennings, Missouri, proposes to prohibit the sale, possession and transportation of cannabis and its derivatives and compounds, except when sold, possessed or transported for medicinal and lawful uses by the producer or manufacturer thereof or dealer therein to licensed physicians, surgeons, dentists, pharmacists, druggists and veterinarians, under such rules and regulations as may be prescribed by the Commissioner of Narcotics.

Bill Introduced: H. R. 6145, introduced by Representative Dempsey, New Mexico, proposes to prohibit the shipment and transportation in interstate or foreign commerce of cannabis and its derivatives and compounds, except when shipped or transported for medical and legitimate uses by the producer or manufacturer thereof or dealer therein to licensed physicians, surgeons, dentists, pharmacists, druggists and veterinarians, under such rules and regulations as shall be prescribed by the Commissioner of Narcotics.

International Association for Dental Research: Officers for 1935-1936 are as follows: Honorary vice-presidents (to be designated); president: Theodore B. Beust; president-elect: William G. Skillen; vice-president: Paul C. Kitchin; treasurer: Bissell B. Palmer; secretary: William J. Gies; trustees of the endowment fund: A. D. Black, R. W. Bunting, Bissell B. Palmer; active editors and executive committee: editor: Theodor Rosebury; associate editor: Edward H. Hatton; assistant editors: Paul C. Kitchin and William J. Gies; finance committee: Arthur D. Black, Russell W. Bunting, Bissell B. Palmer; International Committee on Manuscripts, in languages other than English: (Members now being selected.) Representatives of the Sections of the International Association for Dental Research: Austria: Bernhard Gottlieb, Vienna; Canada: E. Roy Bier, Winnipeg; S. G. Ritchie, Halifax; A. J. McDonagh, Toronto; China: R. Gordon Agnew, Changtu; Czechoslovakia: Jan Jesensky, Prague; England: Evelyn Sprawson, London; Hungary: Josef Szabo, Budapest; South Africa: J. G. M. Shaw, Johannesburg; United States: U. G. Rickert, Ann Arbor; A. H. Schultz, Baltimore; P. E. Boyle, Boston; E. H. Hatton, Chicago; S. W. Chase, Cleveland; R. D. McFarland, Columbus; T. B. Beust, Louisville; W. D. Armstrong, Minnesota; S. S. Arnim, New Haven; Theodor Rosebury, New York; Mrs. C. K. Bryant, Philadelphia; L. E. Van Kirk, Pittsburgh; J. C. Forbes, Richmond; H. C. Hodge, Rochester; J. A. Marshall, San Francisco; R. C. Wheeler, St. Louis; H. E. Harvey, Washington.

FOREIGN

The Profession in India: The condition of the dental profession in India is the subject of an interesting article by Dr. Modi in the *Indian Dental Review.* More than once in the columns of the *British Dental Journal,* attention has been drawn to the neglect of professional education and legislation in India. It would seem that the older the country, the stronger are the shackles forged by the authorities round those who would bring order out of chaos in the practice of dentistry. How long will it be before some steps are taken to institute dental colleges on sound lines in India, that the standard of education may be on a level with that in the rest of the British Empire, and that the diplomas granted may be recognized as registrable in the various parts of the Empire? It might seem a labor of Hercules to attempt to abolish the quackery which is at present so rampant in India, that it has a strangle hold on the practice of dentistry in that country, but reforms have been accomplished in other countries when conditions appeared almost as hopeless.—*Brit. D. J.,* Feb. 15, 1935.

Dentists Honored: Mr. Guy C. Birt, who succeeded Sir Harry Baldwin as sur-

geon-dentist to H. M. the King, is to be congratulated on being made a Commander of the Royal Victorian Order. Another New Year's honor of interest to the dental profession is the baronetcy conferred on Sir Holburt Waring, president of the Royal College of Surgeons and a former member of the Dental Board of the United Kingdom.—*D. Rec.*, February, 1935.

Green Skeleton: The *Matin* recently recorded the finding of a green skeleton during the course of road work at Lyons. From the description given it appears that the teeth were of a brilliant light green and the bones of a darker green, evenly distributed. Dr. Locard of the police laboratory of Lyons believes the bones to be very old, possibly Gallo-Roman, and found that the coloration was due to impregnation with copper salts. He believes that this could not have taken place during life, but was probably due to the presence of bronze objects buried with the body.—*D. Rec.*, February, 1935.

Need of Dental Care: Speaking at the Institute of Hygiene in December, Dr. Alfred Cox, well known as the former secretary of the British Medical Association, said that out of the six million schoolchildren, about half were in need of dental treatment. "A great number of people who grumble about their rates and taxes would not be alive to pay them had not the money been spent in making the country healthier," he added. "Health cannot be bought entirely by the individual, however rich. Only the community can do this."—*D. Rec.*, February, 1935.

Deaths

Barber, Harrison C., Milwaukee, Wis.; Marquette University Dental School, 1901; died recently; aged 67.

Bogart, Simon C., Los Angeles, Calif.; died March 15; aged 82.

Brown, Hilles Talley, Dixon, Illinois; Northwestern University Dental School, 1905; Northwestern University Medical School, 1922; formerly demonstrator in anatomy at the Northwestern University Dental School; on the staff of the Dixon State Hospital; died February 19, in the Veterans' Administration Hospital, Milwaukee, of bronchopneumonia and coronary sclerosis; aged 71.

Clemans, Vernon A., Seattle, Wash.; North Pacific College of Oregon, School of Dentistry, 1914; died February 21; aged 45.

Griffiths, W. S., Milwaukee, Wis.; Chicago College of Dental Surgery, 1896; died March 1; aged 64.

Lupton, Leslie A., Seattle, Wash.; Northwestern University Dental School, 1905; died February 13; aged 52.

Metzger, Francis J., New York City; Marquette University Dental School, 1902; died February 12.

Sykes, Floyd J., Jefferson, Wis.; Chicago College of Dental Surgery, 1894; died February 11; aged 60.

Taylor, Elmer D., Shelton, Nebr.; Northwestern University Dental School, 1909; died February 12.

Taylor, Warren X., Milwaukee, Wis.; University of Louisville, School of Dentistry, 1892; died March 5; aged 67.

Votaw, Charles, Seattle, Wash.; North Pacific College of Oregon, School of Dentistry, 1925; died February 16; aged 39.

Whitcomb, Carroll B., Brooklyn, N. Y.; Thomas W. Evans Museum and Dental Institute, 1910; died February 9; aged 53.

MISCELLANY

BOOK REVIEWS

The Patient and the Weather—Autonomic Dysintegration. By William F. Petersen, M.D., with the assistance of Margaret E. Milliken, S.M. Published by Edwards Brothers, Inc., Ann Arbor, Mich. Price, $6.50.

This is the second volume of a series that will number five or six before completion. It comprises 530 pages including the index. The author says of the work that "it is an interpretation of disease localization predicated on the continued effects of meteorological factors in bringing about stimulation, overstimulation, disease and death." This volume brings together observations made on the individual who is unusually responsive to the environment. The author recognizes that, because of the commonplaceness of the thesis, it is the least impressive to the physician of today. The discussion of teeth and the episodes affecting them are provided by Dr. Stephen of the College of Dentistry of the University of Illinois. Dr. Petersen is in the department of Pathology of the College of Medicine of the same institution.

Nutrition and Physical Fitness. By L. Jean Bogert, Ph.D. Second Edition. W. B. Saunders Company, Philadelphia, Pa., 1935; cloth, $3.00 net.

The first edition of this book appeared in 1931. The quantity of research being done and the progress made makes revision of texts on nutrition necessary at frequent intervals. Accordingly, Bogert has rewritten some chapters and added to or changed the data given in the first edition. While the text is accurately compiled and is full of information from laboratory and experiment station, it is simply written, and even if not for lay reading, a layman may readily understand it.

T.

Sculpture in the Living. By Jacques W. Maliniak, M.D. Published by the Lancet Press, 80 Lafayette Street, New York, 1934. Price, $3.00.

This title carries a subtitle "Rebuilding the Face and Form by Plastic Surgery" without which subtitle the real title means nothing. The foreword written by Wendell C. Phillips, M.D., suggests the book as an aid to physicians in guiding patients to good hands and away from bad ones—those of the quack and cosmetician. It edifies the social worker on the mental effects of deformities curable by plastic surgery and the public as well and the relation of such surgery to organized authoritative medicine. The author's preface indicates the need of information by the public to save them the chagrin of failures, law suits and the depression that results from them. The table of contents is encouraging. It reads like that of a text on surgery. But the real contents of the book leave one in confusion. Cleverness and cheapness combine in the numerous subtitles of the chapters. They make strange companions for the man in white to whom seriousness is such a necessary requisite. To list a few: Mother India Did It, Sermons on War, How Long?, Tastes Have Always Differed, The Moving Finger Writes, One Every Minute, A Ticklish Job, Miracles Never Cease, Much Ado About Nothing, And On Her Garden-Lips, De Gustibus, Sniping at Father Time, Lucky Moderns, Carbolized Youth. The book contains much information, much good advice, but by its own approach, its flippant phrase, its poetic quotations *et al,* it defeats its own purpose.

T.

CORRESPONDENCE

To the Editor: In the March JOURNAL, an article, "Some Observations on Diet and Dental Disease" by R. A. Ferguson, lieutenant-commander (Dental Corps) U. S. Navy, appears. I wish to make a few com-

ments regarding certain statements made by Dr. Ferguson.

On page 398 appears this sentence under the heading of vitamin D: "It is a fat soluble substance, ergosterol, a derivative of cholesterol." This definition appearing in such an authoritative publication as THE JOURNAL might be misleading to many. Ergosterol is not vitamin D. It is not a derivative of cholesterol.

Ergosterol is a sterol occurring in vegetable matter. It is very abundant in fungi, yeast and mushrooms. Ergot is probably the richest source. The chemical formula is $C_{27}H_{42}O$.

Cholesterol is a sterol occurring in animal tissues. The animal fats and blood are among the richest sources. The formula of cholesterol is $C_{27}H_{46}O$. Ergosterol is found in small amounts wherever cholesterol is found.

It is only after ergosterol has been exposed to the action of ultraviolet light that it assumes qualities which have antirachitic properties. After this change takes place, the substance ergosterol becomes "irradiated ergosterol," commonly known as viosterol, which is an artificial form of vitamin D, and has entirely different qualities from those of the vitamin D found in cod liver oil.

Irradiated ergosterol (viosterol) will not protect chicks from leg weakness (rickets) except in toxic doses, while the vitamin D of cod liver oil does protect.

Cholesterol, when irradiated by ultraviolet light, has been shown to be very effective in protecting chickens from leg weakness.

Recently, McBeath has demonstrated that 150 Steenbock units of vitamin D in the form of cod liver oil has more effect in controlling dental caries (in human beings) than 3,750 Steenbock units of irradiated ergosterol (viosterol).

It is probably these confusions of one product as the same substance as another which accounts for the varying opinions regarding the effectiveness of vitamin D in certain studies. It has been recognized that, in the treatment of infantile rickets, at least three times as many rat units of viosterol must be used as of cod liver oil to either heal or prevent.

Another statement in Dr. Ferguson's paper shows some misunderstanding of nutritional fundamentals. There is *no* vitamin D in white wheat bread (page 400). This is, apparently, a confusion with the distribution of the vitamin B complex. He also states that vitamin D is found in "milk (raw summer)." There is no difference in the D content of raw, pasteurized or boiled milk. Vitamin D is heat stable. Vitamin C is affected by the heat of pasteurization and sterilization. The amount of vitamin D in any milk, human or cow, is too small to be of nutritional significance. The maximum amount of vitamin D found in Florida cow's milk is 10 Steenbock units per quart.

The article also states: "Recently, there has been placed on the market a product known as 'irradiated vitamin D milk,' which is pure milk exposed to ultraviolet light. This product has been approved by the Committee on Foods of the American Medical Association and is recommended very highly for its vitamin D content."

The Committee on Foods does not "approve" of irradiated vitamin D milk or any other food product. The committee "accepts" the claims made for certain acceptable food products.

Irradiated vitamin D milk was not the first vitamin D milk to be "accepted" by the Committee on Foods. Vitamin D milk produced by incorporating definite amounts of vitamin D extracted from cod liver oil by a process developed in the laboratories of and controlled by Columbia University was the first to be accepted.

NATIONAL OIL PRODUCTS COMPANY,
Harrison, N. J.,

BION R. EAST, D.D.S.,
Technical Consultant.

March 26, 1935.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, New Orleans, La., November 4-8.

American Academy of Periodontology, New Orleans, October 31-November 2.

American Society of Oral Surgeons and Exodontists, New Orleans, November 1-2.

American Dental Society of Europe, London, July 31-August 3.

American Society of Orthodontists, New York City, April 30-May 3.

Belgian National Dental Congress, Brussels, August 1-4.

Cleveland (Ohio) Dental Society, May 6-7.

Dental Alumni Association, American University of Beirut, Beirut, Lebanon, June.

Eastern Association of Graduates of Angle School of Orthodontia, New York City, May 3.

International Dental Congress, Vienna, Aug. 2-9, 1936.

Montreal Dental Club Fall Clinic, October 17-19.

National Board of Dental Examiners, May 24-25.

New York Society of Orthodontists, New York City, April 30-May 3.

New York State Dental Hygienists Association, Saranac, June 12-15.

North Atlantic Orthodontic Society, Brooklyn, N. Y., April 24.

Northern Ohio Dental Association, Cedar Point on Lake Erie, June 17-18.

Ontario Dental Association, Toronto, May 20-22.

Philadelphia Dental College and Dental School, Temple University Alumni Society, Philadelphia, June 11-12.

American Dental Assistants Association, New Orleans, November 4-8.

American Dental Hygienists' Association, New Orleans, November 4-8.

Society for the Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

District of Columbia at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

STATE SOCIETIES

April

Alabama, at Birmingham (16-18)
California, at Oakland (8-10)
Kansas, at Wichita (22-24)
Kentucky, at Paducah (1-3)
Louisiana, at New Orleans (18-20)
Massachusetts, at Boston (29-May 2)
Michigan, at Detroit (22-24)
Mississippi, at Jackson (22-24)
New Jersey, at Atlantic City (24-25)
Texas, at Waco (15-18)
Wisconsin, at Milwaukee (16-18)

May

Arkansas, at Little Rock (13-15)
Connecticut, at Waterbury (8-10)
Georgia, at Atlanta (13-15)
Illinois, at Quincy (14-16)
Indiana, at Indianapolis (20-22)
Iowa, at Des Moines (7-9)
Maryland, at Baltimore (6-8)
Missouri, at Jefferson City (26-28)
Montana, at Lewiston (9-11)
Nebraska, at Omaha (20-23)
Pennsylvania, at Altoona (7-9)
South Dakota, at Huron (13-14)
Tennessee, at Nashville (14-16)
Vermont, at Burlington (15-17)
West Virginia, at Parkersburg (20-22)

June

Maine, at Augusta (21-22)
New Hampshire, at Rye Beach (26-27)
New York, at Upper Saranac Lake (12-15)
North Carolina, at Blowing Rock (17-19)
Oregon, at Portland (5-8)

July

Southern California, at Long Beach (8-12)

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

Virginia, at Hot Springs (1-3)

November

Louisiana, at New Orleans (4-8)

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, June 24. E. W. Patton, 1807 Comer Bldg., Birmingham, Secretary.

Arkansas, at Little Rock, June 17-20. Clarence W. Koch, 817 Donaghey Bldg., Secretary.

California, at San Francisco, May 27; Los Angeles, June 24. Kenneth I. Nesbitt, 450 McAllister St., San Francisco, Secretary.

Colorado, at Denver, June 18-22. N. C. Gunter, 610 Thatcher Bldg., Pueblo, Secretary.

Connecticut, at Hartford, June 26-29. Almond J. Cutting, Southington, Secretary.

Delaware, at Wilmington, June 19-20. W. S. P. Combs, Middletown, Secretary.

Florida, at Jacksonville, June 24-29. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Georgia, May 30. R. C. Coleman, Atlanta, Joint Secretary, State Examining Boards.

Kentucky, June 11-14. Robert L. Sprau, 970 Baxter Ave., Louisville, Secretary.

Indiana, at Indianapolis, June 18-21. J. M. Hale, Mt. Vernon, Secretary.

Iowa, at Des Moines, May 27-30. Hardy F. Pool, Mason City, Secretary.

Maine, at Augusta, June 24-26. Alton H. Swett, 192 State St., Portland, Secretary.

Massachusetts, at Boston, June. Francis M. Cahill, State House, Boston, Secretary.

Minnesota, at Minneapolis, June 21-27. Paul Hagen, Crookston, Secretary.

Mississippi, at Jackson, June 18-20. T. Ford Leggett, Laurel, Secretary.

Missouri, at St. Louis, June 12-15. George E. Haigh, Central Missouri Trust Bldg., Secretary.

Montana, at Helena, June 8-11. Leonard A. Jenkin, 214 Medical Arts Bldg., Great Falls, Secretary.

Nebraska, at Omaha, and Lincoln, June 17-22. Mrs. Clark Perkins, Lincoln, Director of Examining Boards.

New Jersey, at Trenton, June 24-29. J. C. Forsyth, 148 W. State St., Trenton, Secretary.

New Mexico, at Albuquerque, June 24-26. J. J. Clarke, Artesia, Secretary.

North Dakota, at Fargo, June 9-12. W. E. Cole, Bismarck, Secretary.

Ohio, at Columbus, June 24. Morton H. Jones, 1553½ North Fourth St., Columbus, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 18-22. W. A. McCready, 1115 Highland Bldg., Pittsburgh, Secretary.

Rhode Island, at Providence, June 25-27. Albert L. Midgley, 1108 Union Trust Bldg., Providence, Secretary.

South Carolina, at Columbia, June 17. David Aiken, Winnsboro, Secretary.

Tennessee, at Nashville, May 14-16. E. J. Justis, Exchange Bldg., Memphis, Secretary.

Texas, at Dallas, June 17-21. R. J. Weber, 1014 Norwood Bldg., Austin, Secretary.

Vermont, at Montpelier, June 24-26. H. B. Small, Burlington, Secretary.

Virginia, at Richmond, June 11. John M. Hughes, 715 Medical Arts Bldg., Richmond, Secretary.

West Virginia, at Charleston, June 24-26. H. C. Hill, Charleston, Secretary.

Wisconsin, at Milwaukee, June 17-21. S. F. Donovan, Tomah, Secretary.

MISSOURI STATE DENTAL ASSOCIATION

The next meeting of the Missouri State Dental Association will be held at Jefferson City, May 26-28.

GEORGE E. HAIGH, *Secretary*,
Jefferson City.

NATIONAL BOARD OF DENTAL EXAMINERS

The National Board of Dental Examiners (organized under authority of the American Dental Association) will hold examinations in Parts I and II, May 24-25, in any approved dental school requesting them, provided there are five or more candidates. In cities where two or more dental schools are located, the examinations for all

candidates will be held in a single institution. For further information, application blanks, etc., address

MORTON J. LOEB, *Secretary,*
66 Trumbull St.,
New Haven, Conn.

COLORADO STATE BOARD OF DENTAL EXAMINERS

Examinations for license to practice dentistry or dental hygiene in Colorado will be held in Denver, June 18-22. For further information and application blanks, address

N. C. GUNTER, *Secretary,*
610 Thatcher Bldg.,
Pueblo.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

The next regular meeting of the Delaware State Board of Dental Examiners will be held June 19-20 at the Delaware Hospital, Wilmington. For further information, address

W. S. P. COMBS, *Secretary,*
Middletown.

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

The next examination to be conducted by the Massachusetts Board of Dental Examiners will be held in Boston in June. For further information, address

FRANCIS M. CAHILL, *Secretary,*
State House,
Boston.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

The next examination of the Minnesota State Board of Dental Examiners will be given at the University of Minnesota, College of Dentistry, Minneapolis, June 21-27, for applicants for license to practice dentistry and dental hygiene. Applications and examination fee must be in the hands of the secretary at least ten days before the date of examination. Address all communications to

PAUL HAGEN, *Secretary,*
Crookston.

MISSOURI DENTAL BOARD

The next examination of the Missouri Dental Board will be held at the St. Louis University School of Dentistry, St. Louis, June 12-15. All applications must be in the hands of the secretary at least ten days before the date of examination. For information, address

GEORGE E. HAIGH, *Secretary,*
Central Missouri Trust Bldg.,
Jefferson City.

MONTANA STATE BOARD OF DENTAL EXAMINERS

Examinations for license to practice dentistry or dental hygiene in Montana will be held at Helena, June 8-11. For further information and application blanks, address

LEONARD A. JENKIN, *Secretary,*
214 Medical Arts Bldg.,
Great Falls.

NEBRASKA STATE BOARD EXAMINATION

The next Nebraska State Board Examination will be given, June 17-22. The first three days practical tests will be given at the Creighton College of Dentistry, Omaha, and the University College of Dentistry, Lincoln. The last three days written tests will be given at the State House, Lincoln.

Bureau of Examining Boards,
MRS. CLARK PERKINS, *Director,*
Lincoln.

NEW MEXICO BOARD OF DENTAL EXAMINERS

The New Mexico Board of Dental Examiners will conduct an examination for license in New Mexico at Albuquerque, June 24-26. For further information and application blanks, address

J. J. CLARKE, *Secretary,*
Artesia.

SOUTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

The South Carolina State Dental Board will meet at Columbia, June 17, for examination of applicants for license to practice dentistry and dental hygiene. Applications should be in the hands of the secretary ten days before the meeting. Otherwise, they will not be considered. Application blanks furnished on request.

DAVID AIKEN, *Secretary,*
Winnsboro.

TENNESSEE BOARD OF DENTAL EXAMINERS

The Tennessee Board of Dental Examiners will conduct its next annual meeting at the College of Dentistry, University of Tennessee, Memphis, beginning June 10.

B. C. GALLIMORE, *Secretary,*
McKenzie.

AMERICAN ACADEMY OF PERIODONTOLOGY

The twenty-second annual meeting of the American Academy of Periodontology will be held at the St. Charles Hotel, New Orleans, October 31-November 2. Members of the A.D.A. interested in periodontia are invited to attend this program of scientific papers and clinics.

CLAYTON H. GRACEY, *Secretary,*
Fisher Bldg.,
Detroit.

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

The seventeenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in New Orleans, November 1-2.

HARRY BEAR, *Secretary,*
410 Professional Bldg.,
Richmond.

NORTHERN OHIO DENTAL ASSOCIATION

The seventy-eighth annual session of the Northern Ohio Dental Association will be held at Cedar Point on Lake Erie, June 17-18.

C. R. A. HOFFMAN,
Publicity Committee,
6503 Detroit Ave.,
Cleveland.

NORTH ATLANTIC ORTHODONTIC SOCIETY

The next meeting of the North Atlantic Orthodontic Society will be held April 24 at 8 p.m. in the Knights of Columbus Bldg., Brooklyn, N. Y.

T. H. LE BLANC, *Secretary,*
515 Ocean Ave.,
Brooklyn, N. Y.

CLEVELAND DENTAL SOCIETY

The May Clinic Meeting of the Cleveland Dental Society will be held May 6-7.

G. J. JAMES, *Chairman,*
Publicity, Clinic Committee,
Rose Bldg.,
Cleveland.

NEW YORK UNIVERSITY COLLEGE OF DENTISTRY COURSE IN PERIODONTIA

The second annual postgraduate course in periodontia at the New York University College of Dentistry will be given beginning July 1 and continuing four weeks. For information and application, address Periodontia Department, New York University, College of Dentistry, 209 East Twenty-Third St., New York City.

SAMUEL CHARLES MILLER.

MONTREAL DENTAL CLUB

The eleventh annual fall clinic of the Montreal Dental Club will be held October 17-19, at the Mount Royal Hotel, Montreal.

F. W. SAUNDERS, *Chairman,*
Publicity Committee,
1414 Drummond St.,
Montreal.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

The twelfth annual convention of the American Dental Hygienists' Association will be held in New Orleans, November 4-8, with headquarters at the Hotel Monteleone.

AGNES G. MORRIS, *Secretary,*
886 Main St.,
Bridgeport, Conn.

NEW ENGLAND HEALTH EDUCATION ASSOCIATION

The tenth annual conference (Jubilee Meeting) of the New England Health Education Association will be held May 31-June 1, at the Massachusetts Institute of Technology, Cambridge.

MARION R. KANTER, *Publicity Chairman,*
Roxbury, Mass.

PACKAGE LIBRARIES*

Compiled by and Available for Circulation
from the
LIBRARY BUREAU
of the
AMERICAN DENTAL ASSOCIATION
212 East Superior Street, Chicago, Ill.

†Abnormal secretion of saliva.
Absorption of roots and bone.
†Actinomycosis of head and neck.
Agranulocytic angina.
Alveolar process—its structure and resorption.
Alveolectomy.
Amalgam fillings and physical properties of amalgam.
Anesthesia—discovery and early uses.
†Anesthetics in children's dentistry.
Angle's orthodontic appliances.
Apicoectomy.
Articulation, occlusion and mandibular movements.
Avertin in oral surgery.
Bacteria of the mouth.
Bacteriological studies of root canals.
Best time for orthodontic treatment.
Biographies of dentists.
Blood examination in focal infection.
Bogue's articles from Dental Digest.
†Bridges using inlays as abutments.
Broken needles.
Bureau of Standards reports.
Business side of dentistry.
Calcium metabolism.
Cancer of mouth.
†Carbon dioxide administered in conjunction with nitrous oxid-oxygen anesthesia.
†Cast gold crowns.
Cast gold inlays.
Casting gold, including inlays and dentures.
Cavity preparation.
†Cementation of inlays.
Centric occlusion.
†Child psychology.
Children's dentistry.
Clasps—wire and cast.
Cleft lip and palate—etiology and surgical treatment.
†Cleft palate—orthodontic treatment and prosthetic appliances.
Community and school dental service.
Comparative dental anatomy.
Conduction anesthesia.
Condyle anesthesia.
Condyle path movements.
†Congenitally missing teeth.

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*Each package library contains information on one of the subjects listed and is composed of reprints, magazine clippings, etc., on that subject only. The packages are loaned to members of the Association for a period of one week after date of receipt. Unless the material is reserved for another borrower, an extension of time will be granted on request.

The rental fee for borrowing a package library is 50 cents. This fee must accompany the request for a package library. No packages are sold.

†This package contains less than the usual number of articles.

Contributions dentists have made outside their profession.
†Curetting.
Cysts and tumors of mouth.
Dental assistants.
Dental care of the preschool child.
Dental caries.
Dental cements.
Dental clinics.
†Dental disease and practice in the tropics.
Dental economics.
Dental education.
Dental embryology.
Dental ethics.
Dental health education.
Dental hygienists.
Dental libraries.
Dental metallurgy.
†Dental nomenclature.
Dental service in the World War.
Dental technicians.
Dentifrices.
Dentistry as a career and the status of the dentist.
†Dentistry in foreign lands.
Dentistry of the time of George Washington.
Denture bases—discussion of materials.
Denture casting.
Diabetes and dentistry.
Diathermy in dentistry.
Diet and nutrition in relation to teeth.
Diet in pregnancy.
Diseases of the tongue.
Dry socket.
Education of denture patients.
Electrogalvanic lesions.
†Emphysema.
Endocrine glands in relation to teeth.
†Epithelial débris.
Erosion and abrasion of the teeth.
†Eruption of teeth—dates of eruption and accompanying symptoms.
†Eruption of teeth—theories regarding.
Esthetics in denture construction.
Ethyl chlorid.
Ethylene anesthesia.
Etiology of caries.
Etiology of malocclusion and preventive orthodontia.
Etiology of pyorrhea and its relation to systemic conditions.
Evolution of human dentition.
Examination of the mouth and oral diagnosis.
Extraction of teeth.
†Facebow technic and recording of occlusion.
Fauchard's (Pierre) life.
Fixed and removable bridgework.
Fixed bridgework.
Focal infection.
†Focal infection and arthritis.
†Focal infection and oral sepsis in relation to gastro-intestinal disturbances.
Focal infection in relation to diseases of the eye.
Foreign bodies (of dental origin) in the lungs and esophagus.
Fractures of the jaws.
Full denture construction.
†Gagging.

Gillett and Irving's articles on indirect inlay technic.
Gold foil.
Growth and development of teeth and jaws.
Habits as factors in malocclusion.
Halitosis.
Hemophilia or excessive hemorrhage following extraction.
Hereditary influences in malocclusion.
†Histologic examinations of fractured roots.
Histologic study of teeth and tissues.
Histology of peridental membrane.
History and progress of dentistry.
History of dental education in U. S.
History of dentistry.
†History of full denture construction.
Hospital dental service.
†Hypercementosis and excementosis.
†Hypnotism.
Identification by means of teeth.
Immediate denture service.
Impacted teeth and their removal.
Impacted third molars.
Impacted teeth and their relation to various physical disturbances.
Impacted upper cuspids
Implantation, replantation, transplantation of teeth.
Impression materials and technic.
†Impression taking for cast gold inlays.
Impression technic.
Indirect inlay technic.
Industrial dental service.
Influence of deciduous teeth and first permanent molars on occlusion.
Influence of dental improvements on appearance and mental conditions.
Influence of diet on saliva.
Interpretation of roentgenograms.
Investment compounds and technic.
Ionic medication.
†Jackson's (V. H.) articles on orthodontic appliances.
†Labial frenum.
Lectures to nurses.
Lesions of the mouth.
†Leukemia.
†Leukoplakia.
Local anesthesia.
Local anesthesia—contraindications and untoward results.
Lower denture construction.
†Ludwig's angina.
Malpractice in dentistry.
Masks and casts.
Materia medica and pharmacology.
†Matrix.
Maxillary sinus and antrum—diseases and treatment.
Methods of sectioning and staining teeth.
Monson's theory.
Mottled enamel.
Mouth hygiene.
Muscle exercises and training in orthodontia.
Nitrous oxid-oxygen analgesia.
Nitrous oxid-oxygen anesthesia.
Occlusion in partial dentures.
†Occlusion in relation to operative dentistry.
Opening the bite.
Oral diagnosis with reference to roentgen ray.

Oral manifestations of metallic and drug poisoning.
Oral manifestations of systemic conditions.
Organized dentistry.
Orthodontia and its relation to dentistry and medicine.
Orthodontia for the general practitioner.
†Orthodontic anchor bands.
Orthodontic appliances.
Orthodontic diagnosis and measurements.
†Orthodontic treatment of impacted cuspids.
Osteomyelitis of the jaws.
"Panel" or insurance dentistry.
Partial dentures.
†Permeability of tooth structures.
Physical therapy in dentistry.
†Pinledge and pinlay attachments.
Place of extraction in orthodontic treatment.
Plastic surgery.
Pollia's articles on radiology.
Porcelain in dentistry.
Porcelain inlays.
Porcelain jacket crowns.
Postoperative complications and care.
†Postoperative psychosis.
Pregnancy and dental disease.
Preoperative examination of patients.
Preparation of cavities with hypersensitive dentin.
Preventive dentistry.
Preventive orthodontia.
Procain (novocain) dermatitis.
†Program building for state and district societies.
Prophylactic odontotomy.
Pulp amputation and mummification.
Pulp conservation including pulp capping and cavity lining.
†Pulp pathology.
†Pulp stones.
Pyorrhea.
Relation between dental conditions and the mental health of insane.
Relation of the dentist to the physician.
Removable bridgework.
†Removable bridgework—discussing various types of attachments.
Research Commission reports.
Restoration of oral functions including opening the bite.
Retainers used in orthodontia.
Retention of deciduous teeth and delayed eruption of permanent teeth.
†Retrusion of the mandible causing impaired hearing.
†Roofless dentures.
Root canal treatment.
†Salivary calculus.
†Salivary glands.
†Shock, syncope and collapse.
Should dentistry be advertised?
Silicate cements (see dental cements).
†Silver nitrate.
†Smith's articles on oral prophylaxis.
†Space retention—its importance and methods of accomplishing.
†Speech defects and training.
Staining porcelain teeth.
Stainless steel for orthodontic appliances.
Status of dentistry in our social and economic system.
Sterilization of dental instruments.
Stomatologic program (A.S.S.)

Stomatology—general discussions of.
Stories and rhymes for children.
Studies of enamel including permeability, staining, etc.
Studies of saliva.
Suggestions for talks to mothers.
Suggestions for talks to students.
†Supernumerary teeth.
Surgical treatment of pyorrhea.
Syphilis in relation to dentistry.
Three-quarter crowns.
Tooth arrangement for full dentures.
Toothbrushes and toothbrushing technic.
Toothbrushes, tooth pastes and mouth washes.
†Torus palatinus.
Transplantation of teeth (see implantation of teeth.)
Traumatic occlusion.
Trigeminal neuralgia.
Trismus and ankylosis.
Tuberculosis and dentistry.
Ultraviolet ray in the treatment of pyorrhea.
Ultraviolet ray therapy in dentistry.
Undergraduate and graduate orthodontic education.
Use of elevators in extraction.
Value of dental service in schools.
Value of roentgen-ray examinations in orthodontia.
Various studies of or pertaining to saliva.
Vincent's infection.
Vulcanite and vulcanite stomatitis.
Waxes and wax expansion method.
†Willett's articles.

The Dental Creed

Copies of the creed are available in form suitable for framing from the Library Bureau of the American Dental Association, 212 E. Superior St., Chicago, at 50 cents each. They are 10 by 15 inches and are printed on high grade paper in brown ink. The initial letter may be obtained in red or green, as preferred. Each copy is signed by the author. This creed appeared as an editorial in the August, 1934, issue of The Journal. Kindly send remittance with order.

Written Instructions for Your Denture Patients

A fourth printing of "Your New Teeth," a booklet for denture patients, has just come off the press. This booklet is intended primarily for the patient who is wearing dentures for the first time. It enumerates some of the difficulties that may be encountered when one first wears dentures and offers suggestions as to how these difficulties may be overcome. There is also much of interest to the patient who has been wearing dentures, as information is given regarding the care, repair and rebasing of dentures. The information in this booklet was taken from the article entitled "Instructions for the Edentulous Patient," by B. L. Hooper, which was published in The Journal, February, 1932. The price of these booklets is: 25, $1.00; 50, $1.50; 100, $2.00. Kindly send remittances with order. A sample of booklet will be sent on request.

Orthodontia Editorial

A few more copies of the tribute to orthodontia, which originally appeared as an editorial, may be obtained. This editorial is reprinted in form suitable for framing, on good quality paper, measuring 10 by 15 inches. The print is brown with the initial in green or red, as preferred. The editorial is signed in brown by the author. The cost per copy is 50 cents. Send your order and remittance to the Library Bureau.

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